

***United States Court of Appeals
for the
District of Columbia Circuit***



**TRANSCRIPT OF
RECORD**

175 F Supp

United States Court of Appeals
For the
District of Columbia Circuit

FILED

DEC 1 1959

BRIEF FOR APPELLANTS

Joseph W. Stewart

CLERK

IN THE

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

NO. 15,404 908

LYLLIAN F. LIGHTHALL, Administratrix et al.,
Appellants

v.

ROBERT C. WATSON, Commissioner of Patents,
Appellee

Appeal From a Judgment of the United States District
Court for the District of Columbia

SPENCER B. MICHAEL
SMITH, MICHAEL & GARDINER
Woodward Building
Fifteenth and H. Streets, N.W.
Washington 5. D. C.

Attorneys for Appellants.

WALTER J. BLENKO
WALTER J. BLENKO, JR.
BLENKO, HOOPES, LEONARD & BUELL
1319 Farmers Bank Building
Pittsburgh 22, Pennsylvania
WM. HENRY VENABLE
Blaw-Knox Company
300 Sixth Avenue
Pittsburgh 22, Pennsylvania
Of Counsel.

December 1, 1959.

908

STATEMENT OF QUESTIONS PRESENTED

1. Where applicants for a patent (appellants here) have timely copied claims from an issued patent for the purposes of determining priority of invention between themselves and the patentee by way of an interference and the Patent Office has refused to decide that the subject matter of the copied claims is necessarily and inherently disclosed by the application, not on the ground that the evidence before it was adverse to the applicants, but on the ground that it was insufficient to carry complete conviction, and the applicants thereafter bring a civil action against the Commissioner of Patents pursuant to 35 U.S.C. 145 and present evidence of inherency to the District Court which "was not contradicted and contained information which was not presented to the Patent Office" [*Stradar v. Watson*, 100 App. D. C. 289; 244 F. 2d 737] may the District Court properly decline "to reach its own conclusion on the basis of the fuller information which was before it"?

2. In the circumstances presented in Question 1 where the undisputed evidence which was ignored by the District Court shows that following the instructions set forth in the applicants' specification will necessarily and inherently produce each element of the copied claims, may the District Court properly deny relief on the ground that a processing step described in the specification of the patent does not appear in the applicants' specification, where that step is only an optional one with the patentee and is not a limitation required by the copied claims?

IN THE
United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

NO. 15,404

LYLLIAN F. LIGHTHALL, Administratrix of the
Estate of Albert C. Lighthall, deceased,

ARTHUR B. ANDERSON,

ALBERT C. LIGHTHALL, JR., Trustee,

and BLAW-KNOX COMPANY,

Appellants,

v.

ROBERT C. WATSON, Commissioner of Patents,

Appellee.

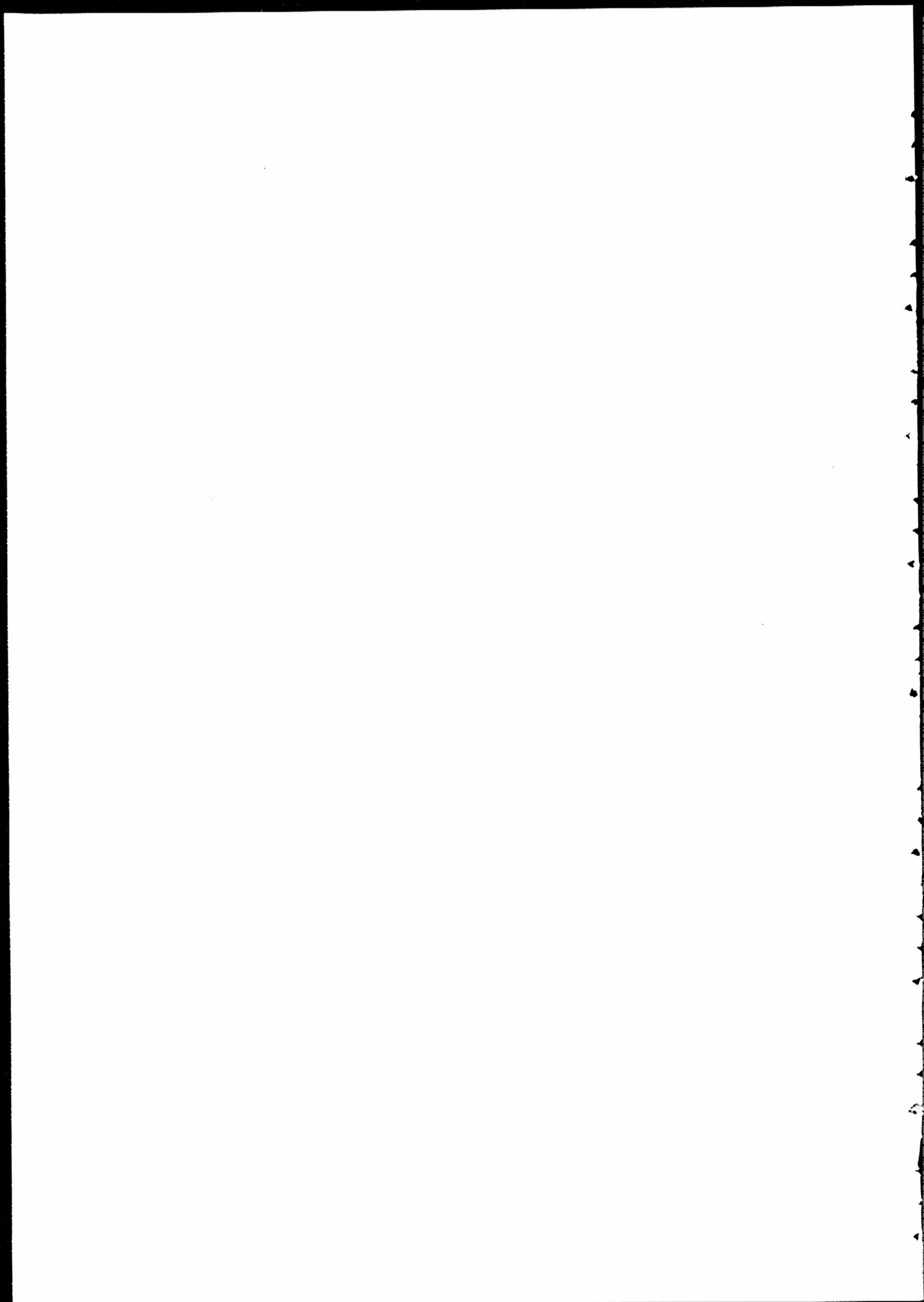


TABLE OF CONTENTS OF BRIEF

	PAGE
Jurisdictional Statement	1
Statement of the Case.....	2
Nature of the Proceeding.....	2
Opinion below	2
Parties and Subject Matter.....	2
The Lighthall-Anderson application.....	5
The Heritage patent.....	10
Factual Identity between Lighthall-Anderson and Heritage	11
The Claims Copied from Heritage.....	13
Statement of Points.....	14
Summary of Argument.....	15
Argument	16
I. The District Court erroneously failed to decide the case on the basis of the entire record before it. The evidence of inherency is undisputed and fully establishes that the subject matter of the copied claims is in- herently disclosed in the Lighthall-Anders- son application	17
II. The claims copied from Heritage patent Re. 24,174 are not limited to optional de- tails not disclosed in the Lighthall-Anders- son application; they should be allowed to Lighthall-Anderson and the application re- turned to the Patent Office for interfer- ence	20
Conclusion	26

TABLE OF CASES

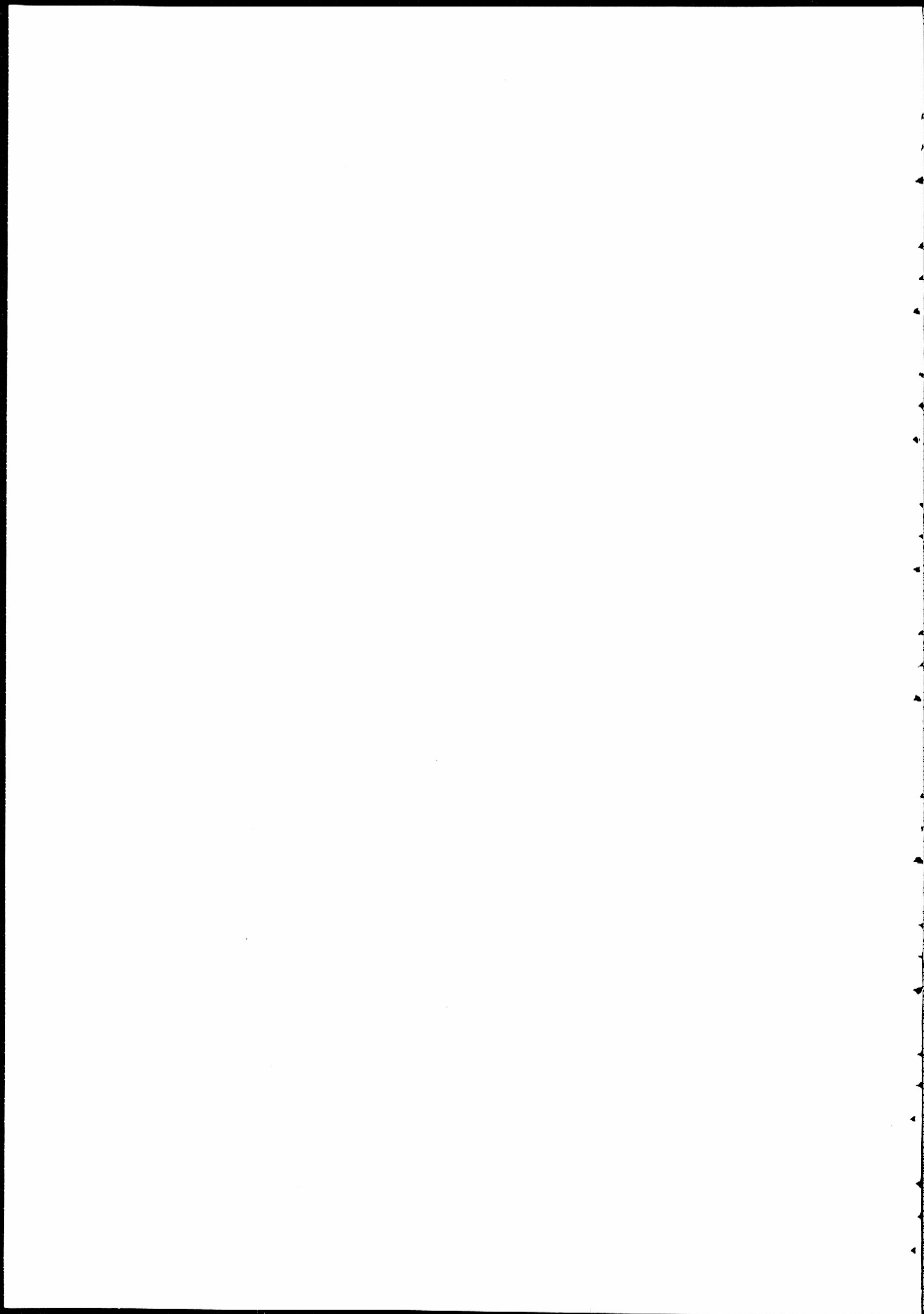
	PAGE
Doble Engineering Co. v. Leeds & Northrup Co., (C.A. 1, 1943) 134 F.2d 78.....	21
Evans v. Watson, (D.C. Dist. of Col., 1956) 142 F.Supp. 225	20, 26
Hansgirk v. Kemmer (C.C.P.A., 1939) 102 F.2d 212	17
Hoover v. Ooms (1946) 80 App. D.C. 318, 153 F.2d 123	17
Lighthall v. Watson (D.C. Dist. of Col., 1959) 121 USPQ 598	2
Raffold Process Corp. v. Castanea Paper Co., (C.A. 3, 1938) 98 F.2d 355.....	21
Strader v. Watson, (C.A.D.C., 1957) 100 App. D.C. 289, 244 F.2d 737.....	19

OTHER AUTHORITIES

28 U.S.C. § 1291.....	1
35 U.S.C. § 145.....	1
Patent Office Rule 304.....	1
Webster's New International Dictionary, 2nd Edi- tion	21, 22, 25

TABLE OF CONTENTS OF JOINT APPENDIX

	PAGE
Relevant Docket Entries	1
Complaint	2
Answer to Complaint	5
TESTIMONY	
Dr. Arthur B. Anderson	
Direct Examination	8
Cross Examination	29
Re-Direct Examination	31
Dr. William T. Nearn	
Direct Examination	32
Cross Examination	35
Plaintiffs' Exhibit 1, Excerpts:	
Specification and Drawing in Lighthall-Anderson Patent Application Serial No. 406,319.....	37
Plaintiffs' Exhibit 2:	
Heritage Patent Re. 24,174	55
Plaintiffs' Exhibit 9:	
Photomicrograph of Defiberized Wood and Bark	63
Plaintiffs' Exhibit 10:	
Photomicrograph of Ground Douglas Fir Bark	65
Defendant's Exhibit 1, Excerpts:	
Anway Patent 2,437,672	67
Pauley Patent 2,446,551	73
Examiner's Answer	81
Decision of Board of Appeals	84
Defendant's Exhibit 3, Excerpt:	
Amendment From File Wrapper of Heritage Patent Re. 24,174	87
Opinion	93
Findings of Fact	99
Conclusions of Law	102
Judgment	103
Notice of Appeal	103



JURISDICTIONAL STATEMENT

This is a civil action against the Commissioner of Patents by applicants for a patent dissatisfied with the decision of the Patent Office. Jurisdiction is conferred on the District Court by the Act of July 19, 1952, c. 195, § 1, 66 Stat. 803, 35 U.S.C. 145. The Complaint was filed within the time set by the Commissioner of Patents pursuant to that act; Patent Office Rule 304 (37 C.F.R. § 1.304; Title 35, U.S.C.A. App. I, page 743). Following trial, the Complaint was dismissed, and a timely Notice of Appeal was filed (JA 103). This Court has jurisdiction by virtue of 28 U.S.C. § 1291.

*Statement of the Case.***STATEMENT OF THE CASE**

Nature of the proceeding: This is a Civil Action following a decision of the Patent Office relating to a patent application in the name of Albert C. Lighthall and Arthur B. Anderson ("the Lighthall-Anderson application") (JA 37) in which the Patent Office denied the applicants the right to copy certain claims from Heritage Patent Re. 24,174 (JA 55) for the purpose of an interference. The trial court affirmed the action of the Patent Office and dismissed the Complaint on July 8, 1959 (JA 102).

Plaintiffs below, appellants here, seek a reversal of that ruling and a decision that they are entitled to copy certain claims from Heritage Patent Re. 24,174 ("the Heritage patent").

Opinion below: The lower court filed an Opinion on June 19, 1959 (JA 93). It is reported at 121 USPQ 598.

Parties and Subject Matter: The plaintiffs, appellants here, own various interests in the Lighthall-Anderson application, which was filed in the Patent Office on January 26, 1954, and bears Serial No. 406,319. Plaintiff Lyllian F. Lighthall is administratrix of the estate of Albert C. Lighthall, deceased, one of the inventors, and executed the Lighthall-Anderson application on behalf of Mr. Lighthall (P-1)*. Plaintiff Dr. Arthur B. Anderson is the co-inventor with Mr. Lighthall and testified at the trial. Out of an abundance of caution, all others having an interest in the application were joined as plain-

* Exhibits are identified by the prefix "P-" or "D-" followed by the number of the exhibit.

Statement of the Case.

tiffs. Plaintiff Albert C. Lighthall, Jr., holds certain interests as trustee. Plaintiff Blaw-Knox Company is licensing agent for the Lighthall-Anderson application and has certain interests therein (JA 2-3).

The Lighthall-Anderson application and the Heritage patent both relate to the manufacture of board-like products from various wood products. They deal with the use of the bark of coniferous trees as an ingredient in the manufacture of composition boards.

The manufacture of board-like products, known as composition boards, from wood products has been known in many forms prior to the filing of the Lighthall-Anderson application. The usual practice is to reduce wood or lignocellulose to particle size, to form the particles into a mat, and to heat and compress the mat to form a board. In some cases, the particles have been formed in a mat while dry, but the particles are frequently dispersed in a slurry. The slurry is then placed upon a Fourdrinier screen to allow the water to drain off, leaving a wet felt or mat from which the board is formed by the application of heat and pressure (JA 25, 37-8) in a heated press. Pressure is applied from a flat or textured "caul plate" which is forced directly against the mat to form a board having a smooth or textured surface corresponding to the surface of the caul plate. Heat is applied concurrently with pressure.

The trunk of a tree in its natural state is surrounded by a layer of bark which is separated from the woody portion by a microscopically thin "cambium" layer (JA 13). In making lumber, the outer portion of the log is

Statement of the Case.

cut off, the cut-away slabs being known as slashings or edgings. The bark clings quite tenaciously to these sections (JA 10, 13). No bark is tolerated on the lumber itself, and it is removed in the saw mill in squaring the log.

Most of the prior workers in the board-making art endeavored to obtain both high strength and high water resistance in their boards. Strength is controlled by applying requisite pressure during heating (JA 37).

When a board is formed from a mat consisting entirely of wood particles, it is highly water absorbent and the resulting board is comparable to blotting paper. Accordingly, it is the usual practice to control water absorption by the addition of sizing materials to the wood particles formed into the mat (JA 26-7, 38). The sizing agent coats the wood fibers and retards absorption of moisture into them.

Although most lumber sources have been used in the manufacture of boards, a particularly useful source is slabs and edgings which are left over when a log is squared in a saw mill. These sections have the bark attached to them. The bark has heretofore been considered an undesirable and deleterious substance and, accordingly, the bark is removed by special machinery so that the slabs and edgings can be used for paper making and the like (JA 10, 13-4). In other cases, the bark containing slabs and edgings have been burned as fuel or as waste (JA 11, 42).

Bark has been avoided in the manufacture of composition boards for the reason that it ordinarily reduces

Statement of the Case.

the strength of the boards quite significantly. Accordingly, it has previously been necessary to debark slabs and edgings before using them as a raw material for composition boards (JA 39-40). The Lighthall-Anderson application and the Heritage patent each disclose a manner in which the bark of a coniferous tree, Douglas fir, can advantageously be used in the manufacture of composition boards.

The Douglas fir is a coniferous tree which is indigenous to the West Coast of the United States and Canada (JA 9, 10). The trees range in size from small seedlings to as large as 5 feet in diameter at breast height; they attain an age of five to seven hundred years (JA 9). The bark of Douglas fir has a thickness which varies with the age of the tree but it may be about one and one-half inches thick in the case of a tree of medium maturity (P-3; P-4; JA 11, 12).

The bark has a variegated cross-section, there being alternate dark and light layers extending outwardly from the woody section of the tree. The light, almost cream colored sections, are cork tissue. The dark brown layers consist largely of bast fibers and amorphous material; they are also known as sclerenchyma tissue and parenchyma tissue, respectively (JA 15; 55, col. 2, ll. 22-5).

The proportion of the constituents in the bark varies with the portion of the tree to which the bark is attached. The bark from the bottom portion of the tree contains the greatest percentage of cork, and the amount of cork in the bark gradually decreases toward the top of the

Statement of the Case.

tree. The weight of cork in Douglas fir bark is not less than 25% and the weight of the cork may exceed 50% of the total weight of the bark (JA 16, 17).

The cork of Douglas fir bark contains substantial amounts of wax which can be extracted chemically in a laboratory. The wax flows readily when heated to a low temperature, melting at about 135°F. It is highly water resistant (JA 17, 18; P-5).

The Lighthall-Anderson application: The Lighthall-Anderson application "relates to water resistant, strong composition boards and like products containing lignocellulose in particle form together with comminuted or defiberized Douglas fir bark" (JA 37). The application describes the conventional manufacture of such boards and states the previously expressed attitude of skilled workers in the art that bark is a harmful constituent in such boards and should be avoided. Lighthall and Anderson then state that Douglas fir bark is useful as a constituent in composition boards and that properly employed it enhances the value of the boards by increasing their water resistance and making use of a former waste product (JA 40).

The application teaches that Douglas fir bark and wood be "reduced to fiber or equivalent finely divided form" (JA 45). The wood may, if desired, be steamed before defiberization in order to soften it. It is "essential" to the practice of the invention that "the bark must be in comminuted or defiberized form" (JA 41). The application teaches (JA 45) that the wood and bark be defiberized in defiberizers "such as the Allis-

Statement of the Case.

Chalmers, the MacMillan, the Bauer, or the Asplund" (JA 45). These are machines which are well known in the art and which disintegrate wood or bark fed to them by separating the fibers one from another, reducing the wood and bark to their component parts (JA 28, 45). Douglas fir slab wood and edgings, a low cost material which includes a substantial amount of bark, is suggested as a suitable raw material. The wood and bark fibers are intimately admixed by the action of the defiberizer and are then formed in a mat or felt which is pressed and heated to form a board.

A limited amount of size may optionally be added to the fibers before they are felted. The amount of size must be strictly limited, however, preferably not exceeding 3% of the weight of the mixture.

A number of procedures and examples representing work actually done by Dr. Anderson and Mr. Lighthall are set forth in the application (JA 19). They show the marked reduction in water absorption brought about by the addition of Douglas fir bark as taught by the specification and give illustrative procedures found to be satisfactory (JA 47-52).

Subsequent to the time Mr. Lighthall and Dr. Anderson made the discoveries set forth in their patent application, a commercial board making plant was installed at Dee, Oregon following the Lighthall-Anderson teachings and operating entirely upon slabs and edgings having their bark attached (JA 19, 20). The boards produced at the plant are hard rigid boards of formed wood products having the character of lumber (P-6). One side of each board is somewhat roughened and

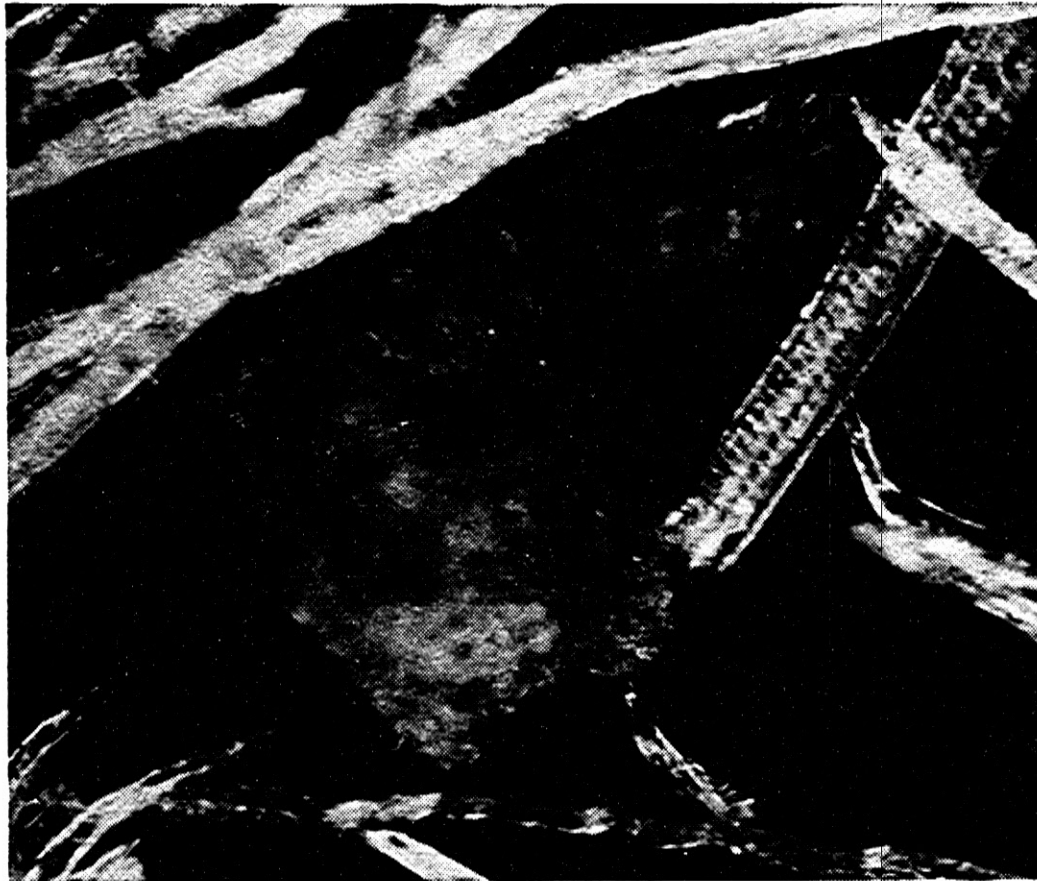
Statement of the Case.

shows the impress of the Fourdrinier screen wire upon which the slurry is placed to drain off a substantial part of the water and form a mat. The other side is pressed smooth by the caul plate which is used in the hot press to press the mat. Some of the boards forming P-6 have a textured surface resulting from use of a caul plate having a similarly textured surface.

The mat in the plant at Dee, Oregon is formed entirely from slabs and edgings, including Douglas fir bark, which has been defiberized as taught by the Lighthall-Anderson application. The raw material is chipped for easy handling (P-7), and the chips are then defiberized into their component parts. The wood is broken down into fibers, and the cork tissue in the bark is broken down and separated from the bast fibers (sclerenchyma tissue) and amorphous material (parenchyma tissue). The cork is separated from the rest of the bark components by the nature of the process (JA 23-4, 26).

A sample of defiberized particles, including all of the constituents of the bark, was taken by Dr. Anderson from the commercial plant at Dee (P-8) and was analyzed by Dr. William T. Nearn of the School of Forestry at Pennsylvania State University. Dr. Nearn examined the sample microscopically and made greatly enlarged photomicrographs of a representative portion of the particles. A reproduction of the photomicrograph, constituting plaintiff's exhibit 9 (JA 63), is reproduced opposite.

Statement of the Case.



CORK PARTICLE IN LIGHTHALL-ANDERSON FIBER

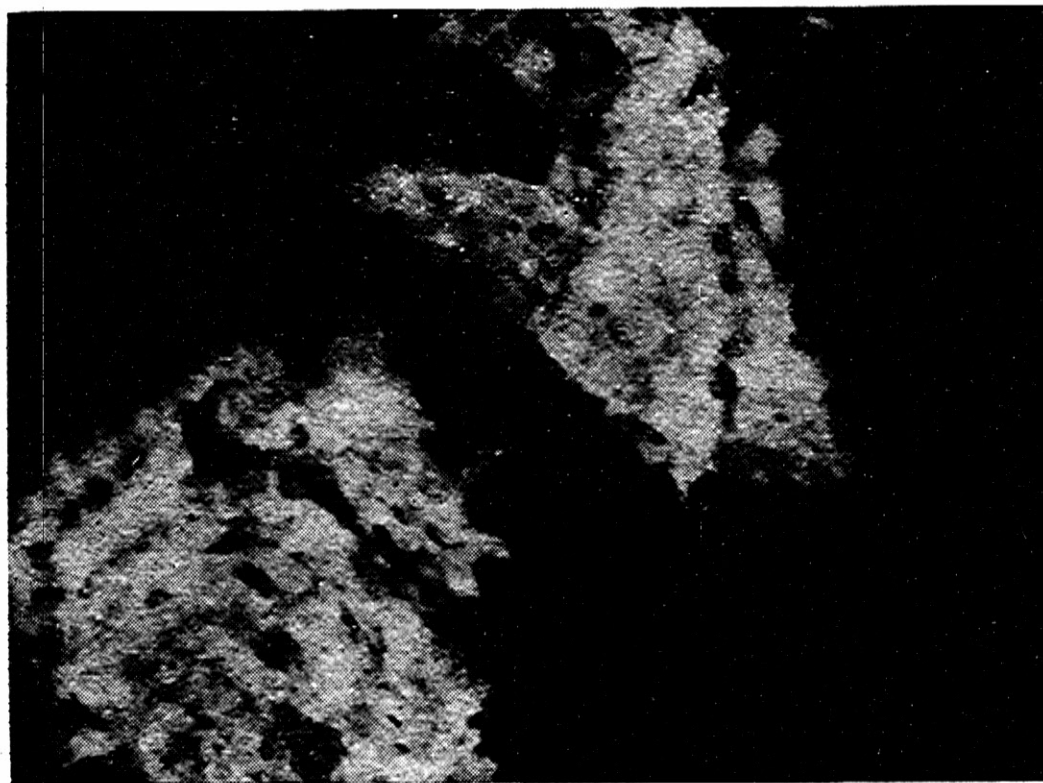
Magnification Approximately 100 X

The irregularly shaped sponge-like particles are de-fiberized cork particles originating in the bark. The elongated thread-like particles are separated fibers from the wood and bark. It will be observed from the photograph that the cork particles are detached and entirely free from the fibers with which they are mingled.

Dr. Nearn also made a laboratory examination of cork particles obtained by the grinding of Douglas fir bark. A photomicrograph of the cork particles was marked as plaintiff's exhibit 10 (JA 65). A reproduction

Statement of the Case.

of the photograph constituting plaintiff's exhibit 10 is reproduced below.



CORK PARTICLE TAKEN FROM DOUGLAS FIR BARK
Approximately 100X

The cork particles shown in P-10 were obtained by grinding a sample of Douglas fir bark (JA 34). As can be seen from the photograph, the cork particles were broken free from the remaining bark constituents and had no non-cork constituents adhering to them. They were completely dissevered and separated from the remaining bark constituents (JA 34).

The Heritage patent: The specification of Heritage "relates to hot pressed structures, usually boards, made from wood particles bonded together with the thermoplastic constituents, and particularly the cork tissue

Statement of the Case.

component, of the barks of coniferous trees" (JA 55, Col. 1, ll. 15-9). The Heritage patent, like the Lighthall-Anderson application, teaches that the wood and bark be defiberized in Asplund and MacMillan machines. As stated by Heritage "The whole bark is subjected to one or more comminuting operations at a controlled moisture content, whereby the non-fibrous phloem is reduced to a powder, the fiber bundles are opened up to release the individual fibers, but the relatively resilient aggregates of cork cells comprising the cork layers are not substantially reduced in size" (JA 55, Col. 2, ll. 16-22). Heritage states that Douglas fir bark is a suitable raw material (JA 55, Col. 2, l. 64; JA 56, Col. 3, l. 25). The suggestion of the Heritage specification is that the whole bark be used, with the limitation that cork constitute not substantially less than 5% of the whole mixture (JA 55, Col. 2, ll. 57-61). Heritage then describes specific techniques for felting and pressing the wood and bark fibers.

Factual Identity between Lighthall-Anderson and Heritage: The language which is employed by Lighthall-Anderson is substantially different in some places than that which is employed by Heritage. Mr. Lighthall and Dr. Anderson were working with the bark and wood as a whole and they so described their work in the application, (JA 15, 37). Heritage, on the other hand, describes the bark components by their technical names. Accordingly, many of the terms differ verbally between Lighthall-Anderson and Heritage. The application and the patent correspond as to all material points:

(a) Both Lighthall-Anderson and Heritage deal with the manufacture of hot pressed, water resistant

Statement of the Case.

composition boards containing wood particles and comminuted bark (JA 37; JA 55, col. 1, lines 15-21).

(b) Both Lighthall-Anderson and Heritage teach that the addition of bark containing cork serves to bind the wood fibers together and imparts water resistance to the board (JA 40; JA 55, col. 1, lines 39-44; JA 57, col. 6, lines 72-4).

(c) Both Lighthall-Anderson and Heritage teach that the bark and wood fibers should be defiberized and distributed uniformly throughout the mixture (JA 41, 42, 45; JA 55, col. 1, lines 19-24, col. 2, lines 16-20).

(d) Both Lighthall-Anderson and Heritage teach that the wood particles and bark may be defiberized in machines such as the "Asplund", "MacMillan", and others well known to workers in the art (JA 45, 49; JA 56, col. 3, lines 26-31).

(e) Both Lighthall-Anderson and Heritage teach the use of "whole bark" and suggest that the bark be introduced with wood chips which are to be defiberized to form the mat from which the board is pressed (JA 40, 42, 44, 45; JA 55, col. 1, lines 19-21, col. 2, lines 57-8; JA 58, col. 7, lines 43-9).

(f) Both Lighthall-Anderson and Heritage teach the use of the same quantity of cork in their boards. Heritage states that the "cork" content of the board should be "not substantially less than 5% of the total mixture of bark and wood particles" (JA 55, col. 2, lines 60-1). Lighthall-Anderson say the same thing in other words—they state that for maximum effectiveness the bark should constitute not less than 20% of the weight of the product (JA 45), and since Douglas fir bark con-

Statement of the Case.

tains a minimum of 25% cork by weight (JA 17), the Lighthall-Anderson hardboard will necessarily contain "not substantially less than 5% cork".

The Claims Copied from Heritage: Heritage patent 2,736,063 issued on February 28, 1956 while the Lighthall-Anderson application was pending in the Patent Office. The claims of the patent were erroneously printed and an application for reissue was filed on April 19, 1956 to correct that error. The patent was then reissued as patent Re. 24,174 on July 3, 1956. While the application for reissue of the Heritage patent was pending, a number of the claims which had been allowed but were incorrectly printed in the original Heritage patent were copied into the Lighthall-Anderson application. These are claims 1 through 8, 12, 15, 17 and 19 of Heritage patent Re. 24,174 and appear as claims 28 through 39, respectively, in the Lighthall-Anderson application. The Patent Office refused to allow the Heritage claims to Lighthall-Anderson concluding that on all the evidence before it, it was not convinced that the subject matter of the copied claims was necessarily and inherently contained in the Lighthall-Anderson application. This action followed. At a trial before the District Court, appellants introduced evidence containing substantial information not before the Patent Office and proving that Lighthall-Anderson do inherently disclose the same invention claimed by Heritage. The District Court filed its Opinion on June 19, 1959. A Judgment of Dismissal followed on July 8. This appeal was taken on September 2.

Statement of Points.

STATEMENT OF POINTS

1. An action under 35 U.S.C. 115 is a trial *de novo* in which it is the duty of the District Court to consider all the proofs presented and render a judgment on those proofs.

The District Court erroneously limited itself to a review of the record before it for the purpose of deciding whether the ruling of the Patent Office was consistent with the evidence.

2. Where evidence is presented to the District Court which was not before the Patent Office, the Court should reach its own conclusion on the basis of fuller information before it.

The District Court erroneously failed or refused to consider evidence presented to it (but not considered by the Patent Office) contrary to the rule of law enounced by this Court in *Stradar v. Watson* (1957) 100 App. D.C. 289; 244 F.2d 737.

3. The claims copied into the Lighthall-Anderson application from the Heritage patent, given their proper meaning, are inherently disclosed in the Lighthall-Anderson application.

The District Court erroneously construed the copied claims, improperly limiting their scope. The correction of the District Court's error in this regard calls for reversal by this Court.

Summary of Argument.

SUMMARY OF ARGUMENT

I. The lower court erroneously failed to decide the case on the entire record before it and to render a judgment that the Heritage claims are inherently disclosed in the Lighthall-Anderson application.

(a) Where there is actual (as distinguished from verbal) identity between a patent application and an issued patent, claims from the issued patent may properly be copied into the application for interference.

(b) The uncontroverted evidence establishes actual identity between the Lighthall-Anderson application and the copied claims.

(c) The lower court erroneously failed to reach its own conclusion on the basis of the evidence before it, limiting itself to a review of the Patent Office proceedings.

II. The claims copied from Heritage do not include optional steps as limitations. The copied claims are allowable to Lighthall-Anderson.

(a) The words of the claims used with their ordinary meaning are fully disclosed by Lighthall-Anderson.

(b) This appeal calls for the application of known rules of law to established facts and calls for reversal of the lower court.

*Argument.***ARGUMENT**

The ultimate question in this case is whether Lighthall-Anderson "inherently", even if not verbally, discloses the same invention set forth in the copied claims; it is agreed that there are semantic differences between the Lighthall-Anderson application and the Heritage patent in at least some aspects of their disclosure. The Patent Office concluded that there was insufficient proof of inherency before it to allow the copied claims to Lighthall-Anderson and declare an interference. At the trial of this action virtually all of the evidence was new evidence presented for the first time to the lower court. The proofs were not before the Patent Office, nor did it consider any comparable evidence.

In its opinion the lower court ruled (i) that it was "only concerned with whether the finding of the Patent Office that plaintiffs did not disclose substantially the same invention as Heritage is consistent with the evidence" (JA 96), and (ii) that in any event, optional processing steps appearing in the Heritage patent indicated that the "primary concept" was different than that of Lighthall-Anderson (JA 97).

Our argument will be in two parts. In the first, it will be shown that the lower court improperly limited itself in its review of the record before it. In the second part of the argument, it will be shown that the copied claims, properly construed, are fully supported by the Lighthall-Anderson application.

Argument.

- I. The District Court erroneously failed to decide the case on the basis of the entire record before it. Then evidence of inherency is undisputed and fully establishes that the subject matter of the copied claims is inherently disclosed in the Lighthall-Anderson application.**

1.

It is apparent from an inspection of the Lighthall-Anderson application and the Heritage patent that there are a number of verbal differences between them, just as they have a number of points of similarity (*supra*, pp. 11-13). It is well established, however, that if the application *inherently* discloses the subject matter of the claims of the patent, then they may be copied into the application for purposes of interference. The rule is stated in *Hoover v. Ooms* (1946) 80 App. D.C. 318, 153 F.2d 123, 125, where this court said:

"It is thoroughly established that one who copies claims for interference cannot prevail unless his application discloses, expressly or inherently, the elements and limitations prescribed by the claim. It is insufficient that a certain result *may* come from a given set of circumstances."

In *Hansgirk v. Kemmer* (C.C.P.A., 1939) 102 F.2d 212, 214, which is there cited Judge Bland said:

"Where one copies a claim from an inadvertently issued patent it should clearly appear that his application disclosed the invention either expressly or inherently.

* * *

he may disclose it by reciting and teaching such subject matter as will inherently do the thing or possess the quality which is claimed for it.

* * *

Argument.

"If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient."

It is not enough that the subject matter of the copied claims *may* result from the teaching of the application, but if the limitations of the copied claims are the natural and necessary result of following the disclosure, then the application is sufficient to support the claims and they must be allowed in the application and an interference declared.

2.

The ruling of the Patent Office is set forth in the decision of the Board of Appeals (JA 84). The critical point is set forth in the following language (JA 86):

"We are not convinced that appellants inherently disclose a separation of the bark into a cork component by reason of their processing. The fact that bark *may* separate from a slurry does not establish such a step in appellants processing or that bark so separated is of a fineness *to present pure cork particles as distinguished from particles having attachment to other bark ingredients as described in the Heritage argument.*" (emphasis supplied).

We invite a reading of the testimony of Dr. Anderson (JA 19 et seq.) describing a commercial board making plant built and operating in accordance with the Light-hall-Anderson disclosure. His unquestioned testimony regarding the effect of defiberization is set out below (JA 26):

"Q. You have described for us and produced samples showing the manner of defiberating the wood in the Douglas fir bark for the purpose of making this defiberated material that is placed on

Argument.

the Fourdrinier screen. My question is, are the cork particles attached to the other bark ingredients or are the cork particles severed from the other bark ingredients as a result of the treatment that you have told us about?"

"A. By the very nature of the process and the anatomy of bark, the cork must be separated from the rest of the bark components."

The oral testimony of Dr. Anderson is confirmed in every respect by the microscopic examination of the actual fibers made by Dr. Nearn and the photomicrograph (*supra*, p. 9, JA 63) which he made of those fibers. His evidence shows beyond any doubt that the steps described in the Lighthall-Anderson application do produce "pure cork particles" not attached "to other bark ingredients". Thus, the fact which the Board of Appeals considered not sufficiently proven by the evidence before it to carry conviction is fully and completely proven by the testimony and exhibits in this record.

3.

This case is controlled by *Stradar v. Watson*, (1957) 100 App. D.C. 289, 244 F.2d 737, 739, where this Court said:

"This proof, which will be noticed later in this opinion, was not contradicted and contained information which was not presented to the Patent Office. That being true, the District Court was not controlled by the presumption of correctness which attaches to Patent Office action, but was free to reach its own conclusion on the basis of the fuller information which was before it."

The lower court did not, however, reach its own conclusion, but limited itself to a review of the Patent Office proceeding contrary to the rule of the *Stradar* case (JA

Argument.

96). The lower court thereby failed to apply well established law to known and undisputed facts and to reach a decision as to the effect of the law on those facts, *Evans v. Watson* (D.C. Dist. of Col., 1956) 142 F.Supp. 225, 227.

II. The claims copied from Heritage patent Re. 24,174 are not limited to optional details not disclosed in the Lighthall-Anderson application; they should be allowed to Lighthall-Anderson and the application returned to the Patent Office for interference.

1.

The opinion of the lower court suggests that the claims are ambiguous and that, if so, they must be construed as requiring certain processing details set forth in the Heritage patent which states (JA 55, Col. 2, lines 2-7) that "the bark *may* be fractionated into its separate components by methods which rely upon the selective comminution of the bark constituents followed by the application of mechanical methods for separating the products of various particle size" (emphasis supplied. Anyway patent 2,437,672 (JA 67) and Pauley patent 2,446,551 (JA 73) are cited as illustrative.

The error of the lower court lies in imputing these parts of the *specification* into the *claims* as limitations of those claims. Heritage claim 3 (Lighthall-Anderson claim 30) is representative. Broken down into its component parts it recites a product comprising two constituents in certain specified proportions.

Argument.

"A hard rigid board of the character of lumber comprising a closely compacted heat-bonded mixture originally of

- (1) wood particles
and
- (2) particles originating in
the bark of coniferous
trees, the mixture comprising by dry weight from
25% to 95% of said wood
particles, and

the remainder being said particles from the bark and including particles of isolated cork in amount of at least 5% of the mixture."

It appears undisputed that Lighthall-Anderson disclose each and every limitation of the foregoing claim except that the lower court held that the Lighthall-Anderson cork is not "isolated". The word "isolated" does not appear within the Heritage specification and is not there given any special meaning as a word of art. Accordingly, it is to be given its ordinary and customary meaning. *Doble Engineering Co. v. Leeds & Northrup Co.*, (C.A. 1, 1943) 134 F.2d 78, 83-4, 85; *Raffold Process Corp. v. Castanea Paper Co.*, (C.A. 3, 1939) 98 F.2d 355, 358. The word "isolated" so far as pertinent in this context, is defined in Webster's New International Dictionary, 2nd Edition, as follows:

"Isolated, adj. Placed or standing alone; detached, separated; solitary."

It will be noted that one meaning is "separated". The words "separated" and "isolated" are used interchangeably throughout the Heritage specification and claims

Argument.

and no particular meaning is given to one over the other. The pertinent definition of "separate" from the same authority is as follows:

"Separate, separated, v. 1. To disunite, disconnect, or sever; to set asunder; as to *separate* friends."

The Lighthall-Anderson process does necessarily produce cork particles which are separated and disconnected from the other particles in the complex (*supra*, p. 19). They are, in the words of Heritage's patent solicitor, "isolated from the remainder of the constituents of the barks, each cork particle [having] its entire surface free and exposed, without attachment to other bark ingredients, whereby its entire surface is available to function as binder for the fibers" (JA 92).

To ascribe any other meaning to the word "isolated" does violence to the claims. The word "isolated" cannot have been intended to require that the cork particles have been screened as described in the Anway and Pauley patents. Heritage claim 3 (*supra*, p. 21) calls for only two constituents, namely, wood particles and particles originating in the bark. The claim expressly requires that the "isolated cork particles" be *included within* the "particles originating in the bark". To read into the claim a screening of the bark particles and a segregation of cork from the remaining bark particles would do violence to the language of the claim. Such a construction of the claim is also contrary to the explicit statement in the Heritage patent that "whole barks * * * are of practical utility in the practice of the invention * * *." (JA 55, Col. 2, lines 57-8).

Argument.

The lower court relied upon certain statements in the Heritage patent which it thought indicated that the Heritage claims required cork particles absent the remaining bark particles (JA. 98). The statement is based upon results shown in Table VI of the Heritage application (JA 59, Col. 9) and a following statement. Table VI compares between Douglas fir cork of 80% purity "+ 14 mesh size" and pure Douglas fir cork "+ 48 mesh". Thus, the figures for the relative strength of the board are not truly comparative. The general statement appearing in the first full paragraph of column 10 of the Heritage patent following Table VI and interpreting it is entirely consistent with the Lighthall-Anderson application. Heritage says that pure cork is of greater value than impure cork, although the latter is stated to be of value. The Lighthall-Anderson application says precisely the same thing. It repeatedly teaches that the bark must be defiberized and dispersed throughout the entire mixture so that its beneficial action is uniformly exerted (JA 41). This recognizes the same phenomenon as Heritage—the cork particles must be completely dissevered from the other bark particles to present their entire surfaces to the other fibers (P-9, *supra*, pp. 6, 9; JA 63).

2.

Heritage claim 7 (Lighthall-Anderson claim 34) is exemplary of the method claims. It requires admixing the components and then pressing them to form a board. Broken down into its components, the claim is as follows:

"A method of making a hot pressed hard rigid board of the character of lumber comprising the steps of

Argument.

- (1) admixing
 - (A) wood particles
 - (B) comminuted bark of coniferous trees, and
 - (C) a separated cork fraction of said bark,
the latter being in an amount of at
least 5% of the mixture
- and
- (2) pressing the mixture under conditions of
heat, pressure and time being sufficient to
increase the density of the mixed mass
into a hard compact board, and to cause
the cork component to flow into intimate
bonding admixture with the wood par-
ticles and bark."

It specifically requires three components, wood, bark (sclerenchyma and parenchyma) and "a separated cork fraction". As discussed above (*supra*, p. 21) the cork cannot be present absent other bark particles without doing violence to the claim and reading one element out of the claim.

The lower court was of the view that the word "fraction" indicated a physical segregation of the cork particles. That meaning is used only in the field of chemistry. The definition of "fraction" given in Webster, *supra*, so far as pertinent here is:

"fraction, n.

- 2. A part or piece broken off; hence, a fragment, scrap"

Thus, the language of claim 7 is entirely consistent with the Lighthall-Anderson teaching.

Argument.

The foregoing definition is entirely consistent with the Heritage specification. After having stated that the bark "may be fractionated" and then mechanically screened as suggested in the Anway and Pauly patents (JA 55, Col. 2, lines 3-10). Heritage teaches that the "whole bark" should be subjected to defiberization (lines 16-22), and then states:

"There are *thus* produced three fractions
* * *." (lines 22-3). (emphasis supplied)

It is clear that the act of defiberization produces the "fractions" of the bark without screening. Heritage, thus, used the work in its usual and customary sense to denote that the defiberization reduces the bark to broken off pieces which are separate from other components originating in the bark.

*Conclusion.***CONCLUSION**

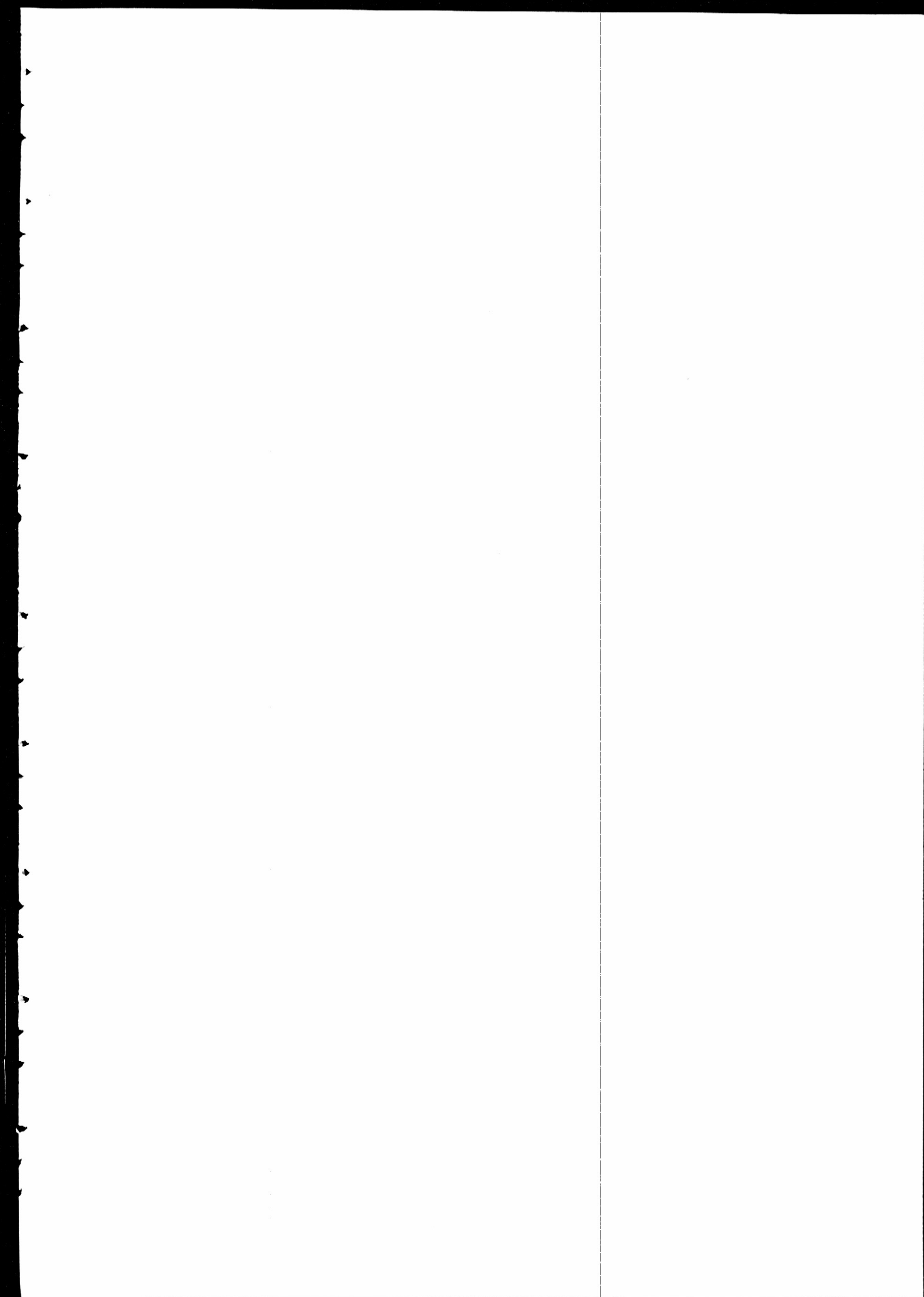
This appeal presents no issue of fact which must be resolved. It requires only the application of known rules of law to the established facts, *Evans v. Watson, supra*. The judgment of the lower court should be reversed, the claims copied from Heritage allowed in the Lighthall-Anderson application, and the application returned to the Patent Office for an interference.

Respectfully submitted,

SPENCER B. MICHAEL
SMITH, MICHAEL & GARDINER
Attorneys for Appellants

WALTER J. BLENKO
WALTER J. BLENKO, JR.
BLENKO, HOOPES, LEONARD & BUELL
WM. HENRY VENABLE
Of Counsel.

December 1, 1959.



BRIEF FOR APPELLEE

IN THE
United States Court of Appeals
For the District of Columbia Circuit

—
APPEAL NO. 15,404
—

FILED DEC 22 1959

Joseph D. Stewart
CLERK

LYLLIAN F. LIGHTHALL, ET AL., *Appellants*

v.

ROBERT C. WATSON, COMMISSIONER OF PATENTS,
Appellee

—
Appeal From the Judgment of the United States District Court
For the District of Columbia
—

CLARENCE W. MOORE,
Solicitor,
United States Patent Office,
Attorney for Appellee

S. WM. COCHRAN,
Of Counsel.

APPEAL No. 15,404

STATEMENT OF QUESTIONS PRESENTED

The appellee disagrees with the Statement of Questions Presented in the Brief for Appellants. In the opinion of the appellee, the question presented is:

(1) Whether the District Court was in error in holding that the words "isolated cork" and "separated cork fraction" were used by Heritage in the claims of his patent, Reissue no. 24,174, to denote cork which had been collected separately from other bark constituents by a separation step.

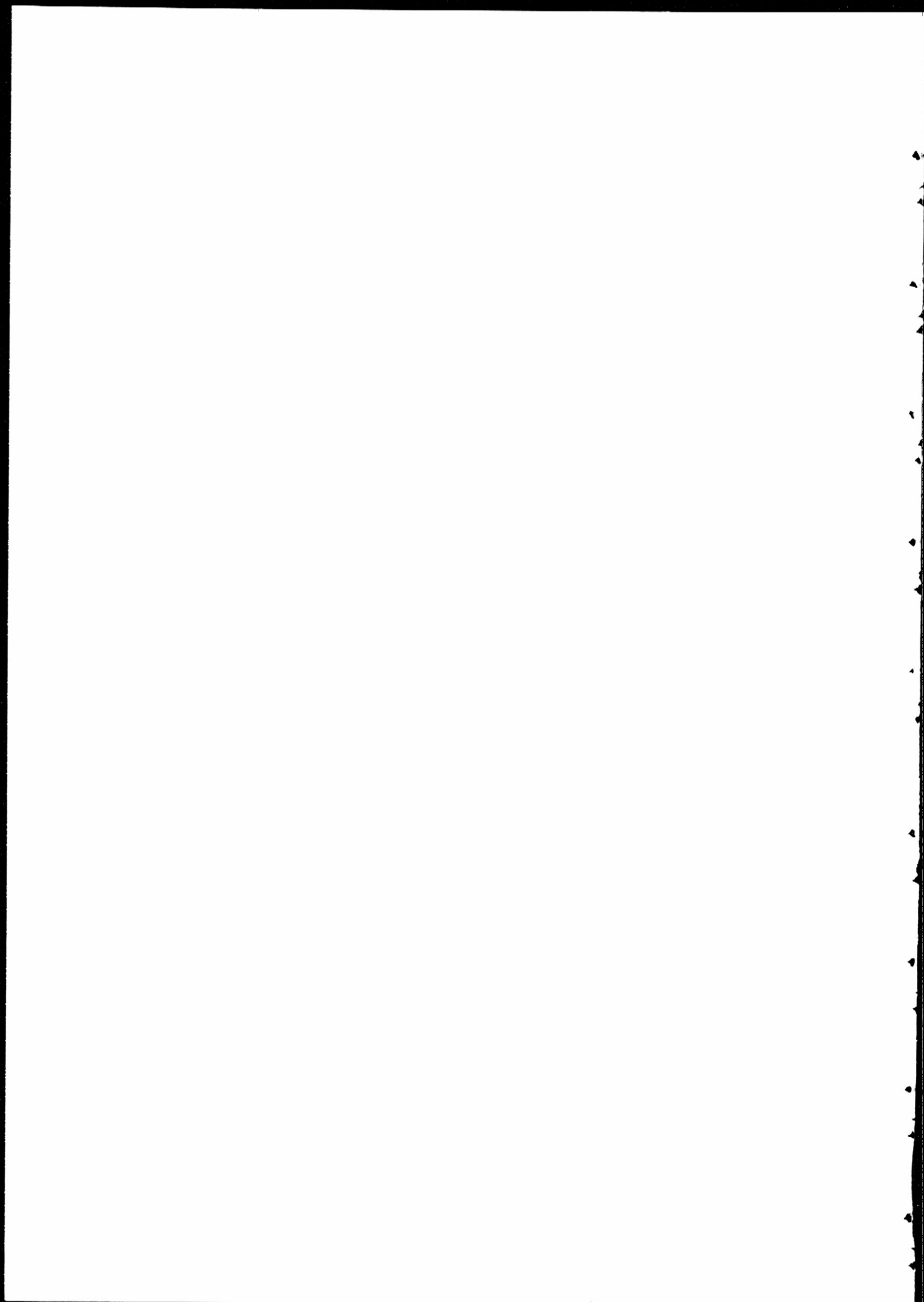
If the District Court is held in error as to the meaning of the Heritage patent claims, the following further questions are presented:

(2) Whether the appellants have proved that the Lighthall-Anderson application for patent, Serial No. 406,319, discloses, with certainty, a process which inherently produces cork which is completely disunited from other bark constituents; and

(3) Whether the allowance of the Heritage patent claims in the Lighthall-Anderson application is not precluded because the application fails to disclose that cork from the bark of conifers broadly may be used.

INDEX

	Page
Counterstatement of the Case	1
Introduction	1
The Lighthall-Anderson Application	2
The Heritage Patent	3
The Claims	7
Summary of Argument	8
Argument	9
The Issues Presented	9
The Heritage Claims Themselves Indicate That the Use of Pure Cork is Intended	10
Heritage's Specification Suggests That His Claims Are Limited to the Use of Pure Cork	13
The Evidence Does Not Establish, With the Necessary Con- clusiveness, That the Lighthall-Anderson Application Dis- closes a Process Which Inherently Produces Cork Which is Completely Disunited From Other Bark Constituents ..	15
The Lighthall-Anderson Application Affords No Support for the Use of the Bark of Any Tree Except Douglas Fir	17
Appellants' Assertion That the District Court Failed to De- cide the Case on the Entire Record is Wholly Unjustified	18
Conclusion	18
DECISIONS CITED:	
<i>Abbott et al. v. Coe</i> , 71 App. D.C. 195, 190 F.2d 449	15
<i>Brogden v. Slater</i> , 17 CCPA 1240, 40 F.2d 988	15
<i>Crawford v. Heysinger</i> , 123 U.S. 589	15
<i>In re De Jarlais</i> , 43 CCPA 900, 233 F.2d 323	16
<i>Doble Engineering Co. v. Leeds & Northrup Co.</i> , 134 F.2d 78	13
<i>Duddy v. Solomon</i> , 44 CCPA 867, 242 F.2d 786	13
<i>Edgerton v. Kingsland</i> , 83 U.S. App. D.C. 1, 168 F.2d 121 ..	16
<i>Esso Standard Oil Company v. Sun Oil Company, et al.</i> , 97 U.S. App. D.C. 154, 229 F.2d 37	15
<i>Holland Furniture Company v. Perkins Glue Company</i> , 277 U.S. 245, 257	17
<i>In re Hollman</i> , 41 CCPA 937, 213 F.2d 323	13
<i>Lindley v. Shepherd</i> , 58 App. D.C. 31, 24 F.2d 606 (1925) ..	16
<i>In re Moore</i> , 33 CCPA 1083, 155 F.2d 379	17
<i>Podelsak v. McInnerney</i> , 26 App. D.C. 399	15
<i>Texas Co. v. Globe Oil & Refining Co.</i> , 225 F.2d 725	13
<i>Watson v. Bersworth et al.</i> , 102 U.S. App. D.C. 187, 251 F.2d 898	18
<i>Wood v. Boylan</i> , 19 F.2d 48	15



IN THE
United States Court of Appeals
For the District of Columbia Circuit

APPEAL No. 15,404

LYLLIAN F. LIGHTHALL, ET AL., *Appellants*

v.

ROBERT C. WATSON, COMMISSIONER OF PATENTS,
Appellee

Appeal From the Judgment of the United States District Court
For the District of Columbia

BRIEF FOR APPELLEE

COUNTERSTATEMENT OF THE CASE

Introduction

This is an appeal from a Judgment of the United States District Court for the District of Columbia (JA-103)* dismissing the complaint (JA-2) in Civil Action No. 2190-57 brought by appellants against the Commissioner of Patents. Appellants sought an adjudication that the application for patent by Albert C. Lighthall, deceased, by Lyllian F. Lighthall, Administratrix, and Arthur B. Anderson, Serial No. 406,319 (JA-37),** discloses the subject matter of

* Pages of the Joint Appendix are denoted herein by the prefix "JA."

** Designated hereinafter as the "Lighthall-Anderson application."

claims 28 to 39 in that application. Those claims originally appeared as claims 1 to 8, 12, 15, 17 and 19 in a patent reissued to Clark C. Heritage, Reissue No. 24,174 (JA-55). They were copied from the Heritage patent by applicants Lighthall and Anderson for the purpose of provoking an interference proceeding in the Patent Office. The Patent Office examiner held (JA-81) that the Lighthall-Anderson application fails to disclose the subject matter of these claims. Upon appeal by the applicants to the Patent Office Board of Appeals, the examiner's holding was affirmed. The appellants sought to overcome the Board's decision by Civil Action No. 2190-57 under 35 U.S.C. 145. Upon consideration of "all the testimony and exhibits adduced at the trial" (JA-98) the District Court dismissed the complaint and this appeal followed.

The Lighthall-Anderson Application

The essence of the teaching in the Lighthall-Anderson application (JA-37) is stated (JA-40) to be that the bark of Douglas fir, when incorporated in fibrous composition boards, enhances the value of the boards by increasing their water resistance. In the application process, bark is comminuted or defiberized for distribution throughout the board mixture and the board is formed in the usual way. The Lighthall-Anderson application suggests only the use of whole bark as an ingredient. It does not suggest that any bark constituent be removed from the defiberized bark for separate addition to the board mix. It does not expressly state that any component of the bark is liberated from any other by reason of the defiberizing step.

The Heritage Patent

The Heritage patent discloses a hot pressed board or other structure wherein "the cork and parenchyma tissue components of the bark of coniferous trees may be utilized as thermoplastic binding material for binding together fibers or other wood particles conventionally used in the making of hot pressed structures, such as boards, molded articles, and the like" (JA-55, column 1, lines 39 to 44). Although Heritage found both cork and parenchyma tissue useful as binders, his patent states (JA-55, column 2, lines 1, 2) that cork is "the bark component preferred as the binder material" because it "provides better flow characteristics than the parenchyma tissue component; produces boards of lower density than the parenchyma tissue and thereby enables the attainment of higher strength-density ratios that can be obtained with parenchyma tissue" (JA-55, column 1, lines 68 to 72).

As a preferred way to practice his invention, Heritage prepares and uses, as a binder, cork which has been separated from bark by a special separating step which follows, and is in addition to comminution or defibration of the bark. He states (JA-55, column 2, lines 3 to 11):

"The bark may be fractionated into its separate components by methods which rely upon the selective comminution of the bark constituents *followed by the application of mechanical methods for separating the products of various particle size*. Such methods are represented by those disclosed in the patent to Anway for Method of Treating Bark, No. 2,437,672, issued March 16, 1948, in the patent to Pauley for Production of Pure Bark Fiber, No. 2,446,551, issued August 10, 1948, * * *."

The Anway and Pauley patents (JA-67 and JA-73, respectively) disclose methods wherein cork is recovered in purified form from bark by separating steps which follow comminuting operations. Anway shows screens 22 and 23 in his drawing (JA-67) on which are retained pure cork particles of two different sizes. Pauley shows screens 19 and 21 in his drawing (R. 73) for performing the same function.

Heritage describes the desirable characteristics of a board made entirely with cork (JA-55, column 2, lines 26 to 36) and indicates that the other bark constituents give less desirable properties (JA-55, column 2, lines 36 to 56).

Heritage does mention the use of whole bark as a board ingredient. He states (JA-55, column 2, lines 57 to 61):

“Whole barks containing an appreciable amount of cork are of practical utility in the practice of the invention, it being necessary, however, that the cork content of the bark constitute not substantially less than 5% of the total mixture of bark and wood particles.”

When whole bark is used, Heritage states, constituents of the bark, less desirable than cork, “contribute their respective properties to the completed board * * *” (JA-55, column 2, lines 61 to 63) but the resulting product is, nevertheless, “of practical utility.”

Heritage's specification furnishes further evidence that he considers the use of a separated fraction of pure cork to be much superior to the use of whole bark. For example, he describes tests (JA-59, column 9, line 41 to line 59) which demonstrate that the strength of a

board is increased almost eight-fold "by the use of substantially pure cork (i.e. cork of about 98 percent purity) in contrast to a bark fraction containing approximately 80 percent cork and 20 percent bast fibers, wood and other impurities * * *" (see Table V). Similarly, Table VI (JA-59, column 9, lines 65 to 75) demonstrates, in Heritage's words, that "The difference between the use of substantially pure cork and cork of 80 percent purity in the 50-50 mix with hogged waste raises the modulus of rupture values from 280 to 800 pounds per square inch" (JA-59, column 10, lines 7 to 11).

Heritage's specification includes other explicit references to the preparation of "pure" cork and to its advantages as opposed to cork in admixture with other bark constituents. In column 3, lines 62 to 64 (JA-56) Heritage states that "The cork used as a binder for the hardboard is obtained from the barks of coniferous trees in a manner hereinbefore described." Heritage there refers to the cork preparation processes described in the paragraph beginning at line 3, column 2 (JA-55) which include a separation step to derive pure cork. Contrary to appellants' apparent assumption (Brief for Appellants, page 12), Heritage does not refer to the methods described in the paragraph beginning at line 18 in column 3 (JA-56). That paragraph deals only with the preparation of "the fibrous material employed in the preparation of the boards of the present invention * * *" (lines 18 and 19, column 3, JA-56) which is to be admixed with the cork. In his discussion of methods of making hard boards, Heritage refers, in one instance, to the use of "whole bark" (JA-58, column 7, lines 41 to 43) as an alternative to the use of

cork. By so naming whole bark as an alternative, Heritage emphasizes once more that he draws a distinction between cork, on the one hand, and whole bark, on the other. That distinction is also evident in Heritage's reference to "comminuted bark" in lines 45 and 46 of column 8 (JA-58), as one of the many materials which could be used as "wood particles for core boards and the like" (line 43, column 8, JA-58) to be combined with a separate cork ingredient. Express reference is made to "pure cork" and to "pure Douglas Fir cork," respectively, in the second line of Table IV (lines 20 to 30, column 9, JA-59) and in lines 37 and 38 of column 9.

In summary, Heritage's specification discloses

- (1) that the thermoplastic components of conifer bark are useful as binders in hot-pressed structures;
- (2) that the cork component is to be preferred over the other thermoplastic component (parenchyma tissue) for such purpose;
- (3) that the cork is obtained from bark by processes, such as disclosed by Anway and Pauley, which include separation steps to isolate purified cork from the other bark constituents;
- (4) that whole bark, as distinguished from pure cork, is of "practical utility" as an ingredient for a board mix; and
- (5) that the strength of boards using pure cork is many times greater than that of boards using cork having as little as 20 percent impurities admixed therewith.

The Claims

As indicated, the claims involved in this proceeding (claims 28 to 39 of the application in suit) appear in the record respectively as claims 1 to 8, 12, 15, 17 and 19 of the Heritage patent, where they originated. Claims 28 to 32 and 39 are directed to a board product and claims 33 to 38 are drawn to a method of making a pressed board product.

As exemplary of the product claims, claim 28 reads as follows:

28. A hard rigid board of the character of lumber comprising a closely compacted heat-bonded mixture originally of wood particles and *particles of isolated cork originating in the bark of coniferous trees*, said cork being present in an amount equal to at least 5% of the mixture and said wood particles being present in amount in the range from 25% to 95% of the mixture.

The words in the claim which are of importance in this proceeding have been emphasized. All of the product claims call for particles of "isolated" cork "originating" in coniferous tree bark. Claims 29 and 30 (Heritage's claims 2 and 3) call for particles of tree bark as an ingredient in addition to the isolated cork particles. Claim 39 refers to "a separated cork component originating in" comminuted bark of coniferous trees.

Claim 33, representative of the method claims, reads as follows:

33. A method of making a hot pressed hard rigid board of the character of lumber comprising the steps of admixing wood particles and *a separated cork fraction of the bark of coniferous trees*, the latter being in an amount of at least 5% of the

mixture, and pressing the mixture under conditions of heat, pressure and time sufficient to increase the density of the mixed mass into a hard compact board and to cause the cork component to flow into intimate bonding admixture with the wood particles.

SUMMARY OF ARGUMENT

One principal issue is presented for the Court, whether the Patent Office and the District Court correctly interpreted the copied Heritage patent claims. The issue as to whether the Lighthall-Anderson application inherently discloses the subject matter of the Heritage patent claims as appellants interpret them is reached only if the District Court was in error on the principal issue.

Support for the view that the Heritage patent claims are directed to the use of pure cork is to be found in the claims themselves. Under dictionary definitions of the crucial words in the claims and by reason of the conjoint use of those words, the claims require the use of pure cork.

Assuming that the claims are to any extent ambiguous, such ambiguity is resolved by Heritage's specification which indicates that the use of pure cork is his primary concept. The specification repeatedly expresses preference for the use of pure cork and cites tests showing greatly improved properties flowing from the use thereof. The prosecution history of Heritage's application in the Patent Office shows that the limitation of the patent claims to "isolated" cork was added to avoid a rejection on prior art. Heritage then indicated that he considered "isolated" cork to mean pure cork.

Even if the Heritage patent claims are interpreted as broadly as appellants argue they should be, appellants have not conclusively proved that the Lighthall-Anderson application inherently discloses the subject matter of the so interpreted patent claims. The evidence does not establish that the Lighthall-Anderson process is such that the cork is completely liberated in the bark mixture. The testimony of one witness indicates, in fact, that a separation step is necessary.

The Heritage patent claims call for the use of cork from the bark of "coniferous trees." There are many coniferous trees other than Douglas Fir. Since the Lighthall-Anderson application disclosure is limited to the use of Douglas fir bark, the claims are broader than the application disclosure and, therefore, lack support therein.

Appellants' assertion that the District Court failed to decide the case on the entire record is unsupportable on the record.

ARGUMENT

The Issues Presented

In their brief, appellants deal first with the question as to whether the lower court gave proper consideration to evidence which they say tends to establish "that the subject matter of the copied claims is inherently disclosed in the Lighthall-Anderson application" (Brief for appellants, page 17). Appellee suggests that it would be more logical first to approach another, more dominating matter, that is, the meaning to be ascribed to the claims. The District Court ruled (JA-96, 97, 98, 100, 101) that the claims call for the use of pure cork which has been segregated from other bark

constituents.* Appellants are not understood to contend that the Lighthall-Anderson application discloses any such segregation of pure cork, even inherently. Rather, they are believed to assert (Brief for Appellants, pages 20 to 25) that the claims do not require such segregation. Whether they are right in that contention should logically be decided first.

Accordingly, the first and principal issue is:

whether the words "isolated cork" and "separated cork fraction" were used by Heritage in his patent claims to denote cork which had been segregated from other bark constituents by a separation step, as opposed to the mere disuniting of the constituents in the process of defibration or comminution.

Unless the District Court was in error in deciding that issue in the affirmative, this Court need reach no further issue, and affirmance is in order. In the event that this Court holds that the District Court was in error and that Heritage's claims embrace the use of cork which is merely disunited from bark without segregation therefrom, appellants must prevail on a second issue in order to be entitled to relief. That issue is:

whether the Lighthall-Anderson application discloses a process which (1) inherently produces cork which is completely disunited from other bark constituents and (2) is otherwise commensurate with the Heritage claims.

The Heritage Claims Themselves Indicate that the Use of Pure Cork Is Intended

The Heritage claims use terms which, given proper connotation in the context of the claims, support the

* In this brief, the term "pure cork" is intended to denote cork which has been segregated by a separation step and, accordingly, is not in admixture with other substances.

view that the use of pure cork is intended. Claim 28 (Heritage claim 1) calls for the use of "particles of isolated cork originating in the bark of coniferous trees." The definition of "isolate" in chemistry is "To separate from all other substances; to obtain pure or in a free state" (Webster's New International Dictionary, Second Edition, Unabridged, G. & C. Merriam Company, Springfield, Mass., 1937). Since chemistry is "The science that treats of the composition of substances, and of the transformations which they undergo," (Webster's New International Dictionary, *supra*) and Heritage is describing substances and their transformations in a technical disclosure, chemical definitions are most appropriately applicable to the words of his claims. Even applying a broader definition of "isolated" as synonymous with "detached" or "separated," as urged by appellants (Brief for Appellants, page 21), the conjoint use of "isolated" with "originating in the bark of coniferous trees" clearly denotes that the cork had its source in such bark and has been removed therefrom. In the broad definition quoted by appellants (Brief for Appellants, page 21), "isolated" is said to mean "Placed or standing alone" and "solitary." Cork particles which remain in admixture with other particles cannot be said to be either "placed or standing alone" or "solitary."

Claims 33 and 34 (Heritage claims 6 and 7) use the words "separated cork fraction" in referring to the cork additive. The definition of "separate," with reference to substances, is

"7. To isolate from a combination or mixture: as, to separate gold from an alloy; * * *" (Webster's New International Dictionary, *supra*).

Being "separated," Heritage's cork is isolated *from* the mixture of bark constituents, that is, collected separately therefrom as pure cork. This view is reinforced by the fact that the word "fraction" is also employed. "Fraction" has a definite meaning in chemistry: "one of several separately collected portions, as of a distillate or precipitate" (Webster's New International Dictionary, *supra*).

Issue is taken with appellant's statement (Brief for Appellants, page 22) that to read claim 30 (Heritage claim 3) as calling for "a screening of the bark particles and a segregation of cork from the remaining bark particles would do violence to the language of the claim." That claim reads:

30. "A hard rigid board of the character of lumber comprising a closely compacted heat-bonded mixture originally of wood particles and particles originating in the bark of coniferous trees, the mixture comprising by dry weight from 25% to 95% of said wood particles, and the remainder being said particles from the bark and including particles of isolated cork in amount of at least 5% of the mixture."

As specified in the claim the mixture comprises "wood particles and particles originating in the bark of coniferous trees." The "particles from the bark," the claim states, include "particles of isolated cork." Nothing in the claim suggests that the particles of isolated cork are not pure cork which has been added to the bark particles. The words "isolated," and "originating" would, as already indicated, seem to require the use of cork which has been previously separated from bark. Claim 30 contains another suggestion that cork has been separately collected before addition to

the mixture in specifying that particles are "particles from the bark" rather than particles which have remained in mixture.

Heritage's Specification Suggests that His Claims Are Limited to the Use of Pure Cork

It is believed apparent that the District Court and the Patent Office applied accurate and apt definitions to the terms of the copied claims. Even assuming that appellant's broader definitions have any application and that, to any extent, the claims are ambiguous, Heritage's specification amply supports the view that the claims are limited to the use of pure cork. It is accepted law, and appellants do not contend otherwise, that where the meaning of patent claims is in question, recourse to the specification to determine the intent of the patentee is appropriate, *In re Holman*, 41 CCPA 937, 213 F. 2d 323; *Duddy v. Solomon*, 44 CCPA 867, 242 F. 2d 786, *Texas Co. v. Globe Oil & Refining Co.*, 225 F. 2d 725; *Doble Engineering Co. v. Leeds & Northrup Co.*, 134 F. 2d 78 (cited by appellants on page 21 of their brief). As pointed out hereinbefore, Heritage repeatedly refers in his specification to the distinct advantages of cork as a binder as opposed to other bark constituents (parenchyma and sclerenchyma tissue) (JA-55, column 1, lines 58 to 72, and column 2, lines 26 to 57). Heritage flatly states that "cork purity was found to have a sharply significant effect on board quality," (JA-59, column 9, lines 41 and 42), referring to tests showing an almost eight-fold increase in strength when pure Douglas Fir cork was used instead of 80% pure cork of the same size (48 mesh) (JA-59, column 9, lines 50 to 59). Boards incorporating 50% hogged waste similarly showed an increase from a

modulus of rupture of 280 pounds per square inch to 800 pounds per square inch by the use of pure cork. Appellants' attempt (Brief for Appellants, page 23) to discount this last test by reference to the difference in size of the impure cork (+ 14 mesh) and the pure cork (+ 48 mesh) must fail. They seem to imply that comminution to + 14 mesh leaves the particles too large for the cork to be "completely dissevered from the other bark particles to present their entire surfaces to the other fibers" (Brief for Appellants, page 23). Failure to comminute sufficiently, they seem to say, explains the test results rather than the use of pure cork. If, in fact, appellants wanted to press such a contention, the matter was one for proof at the trial, rather than speculation now. Evidence could have been offered, if such were the case, to show that comminution to + 14 mesh was insufficient to bring about the beneficial effect of the cork. No such evidence was offered. It seems significant that Heritage, himself, draws no such conclusion. He refers only to the "difference between the use of substantially pure cork and cork of 80 per cent purity" as the cause of the increase in strength (JA-59, column 10, lines 7 to 11). The District Court was eminently correct in concluding that Heritage's primary concept is the use of separately collected cork particles. His disclosure, in fact, would seem to support no other view.

The prosecution history of the Heritage application before the Patent Office, although not referred to by the District Court, also is pertinent. As shown by Defendant's Exhibit 3 (JA-87), Heritage amended his claims April 12, 1955 to limit them to the use of "isolated" cork particles. Such amendment was made to overcome a final rejection on prior art. This action

by Heritage would alone seem to indicate that he ascribed particular significance to "isolated" as a patentable distinction. In presenting the amendment, Heritage's representatives stated:

"It is pointed out that the change of language so that the originally-described cork components is now specified as isolated cork particles, overcomes the application of the prior art in the rejection. In using a whole bark, the cork component is present but it does not enter the mixture as isolated cork particles. It was indicated when the cork particles are isolated from the remainder of the constituents of the bark, each cork particle has its entire surface free and exposed, without attachment to other bark ingredients, whereby its entire surface is available to function as binder for the fibers."

Consideration of the prosecution history of a patent to interpret the claims of the patent is entirely proper, *Crawford v. Heysinger*, 123 U.S. 589; *Wood v. Boylan*, 19 F. 2d 48; *Brogden v. Slater*, 17 CCPA 1240, 40 F. 2d 988; *Podelsak v. McInnerney*, 26 App. D.C. 399.

The Evidence Does Not Establish, with the Necessary Conclusiveness, that the Lighthall-Anderson Application Discloses a Process Which Inherently Produces Cork Which Is Completely Disunited From Other Bark Constituents

The second issue, the question of inherency in their own disclosure, is that upon which appellants concentrated their evidence at the trial. In invoking the doctrine of inherency, the appellants have assumed a formidable burden. As to all questions upon which the Board of Appeals ruled, appellants must show clear error in the Board's decision (*Abbott et al. v. Coe*, 71 App. D.C. 195, 190 F. 2d 449; *Esso Standard Oil Company v. Sun Oil Company, et al.*, 97 U.S. App. D.C.

154, 229 F. 2d 37). A separate and additional burden, applying particularly when inherency is urged, is aptly referred to in *In re De Jarlais*, 43 CCPA 900, 233 F. 2d 323, as follows:

"It is well settled that where the certain function does not *necessarily* occur in the operation of the disclosed device, it has not been shown to be inherent. * * * That the claimed invention is inherent *cannot be established by probabilities or possibilities.*" (Emphasis supplied)

This Court has expressly held that, where a claim is copied from a patent, "' * * * the burden is on the appellant to show a clear basis for it in his disclosure and *doubts as to his right to make it are to be resolved against him.*' *Lindley v. Shepherd*, 58 App. D.C. 31, 24 F. 2d 606 (1925)." *Edgerton v. Kingsland*, 83 U.S. App. D.C. 1, 168 F. 2d 121 (Emphasis supplied).

The trial evidence, it is submitted, does not establish, with the required degree of conclusiveness, that the Lighthall-Anderson cork particles have no attachment to other bark ingredients and thereby satisfy even appellants' broad construction of Heritage's claims. At the trial, for example, the witness Arthur B. Anderson admitted (JA-30) that the attrition mills employed in the Lighthall-Anderson process were adjustable to vary the extent to which the bark is comminuted or defiberized. This testimony prompts the conclusion that the defiberizing operation could be so carried out that a complete defiberization does not take place, and the cork is, thus, not wholly liberated.

Similarly, the testimony by Dr. Nearn is believed to have been less than conclusive. He asserted (JA-34) that the cork particles in Plaintiffs' Exhibit 9 (JA-63)

(in admixture) were "essentially" the same as those in Plaintiffs' Exhibit 10 (JA-65) (subjected to a separation step). However, he also admitted that the flotation separation, which produced the cork of Exhibit 10, "cleaned it up a little" (JA-34) and removed amorphous powder which was "clinging in there" (JA-36). This testimony would seem to constitute an admission that the cork in admixture in Exhibit 9 had particles clinging thereto and a separation step, such as that taught by Heritage, was necessary.

The Lighthall-Anderson Application Affords No Support For the Use of the Bark of Any Tree Except Douglas Fir

Although not mentioned in the District Court's decision, there is a further reason for holding that the Lighthall-Anderson specification falls short of affording the required support for the copied claims. All of those claims call for the use of bark "of coniferous trees." The Heritage specification refers broadly to the use of the bark of coniferous trees (JA-55, column 1, lines 18, 41, 59). Dr. Anderson admitted at the trial (JA-29, 30) that the Lighthall-Anderson disclosure, by contrast, is limited to the use and treatment of the bark of Douglas Fir, which is only one of many conifers (JA-29).

The claims, then, are admittedly broader than the Lighthall-Anderson disclosure. They may, on that ground alone, be properly held not allowable in the Lighthall-Anderson application. *Holland Furniture Company v. Perkins Glue Company*, 277 U.S. 245, 257; *In re Moore*, 33 CCPA 1083, 155 F. 2d 379.

**Appellants' Assertion that the District Court Failed to Decide
the Case on the Entire Record Is Wholly Unjustified**

The appellants' statement (Brief for Appellants, page 19) that the District Court "limited itself to a review of the Patent Office proceeding" is refuted by that court's Opinion (JA-93). The Opinion includes the express statement (JA-98), "*Based upon all the testimony and exhibits adduced at the trial, the Court is convinced that a rational basis existed for the ruling of the Patent Office * * *.*" (Emphasis supplied).

It was pointed out to the District Court by appellee that appellants produced no evidence on the principal point in issue, the meaning of Heritage's claims. Indeed, it is not clear how appellants could have presented admissible evidence on that point. The testimony of experts on the meaning of patent claims is inadmissible, *Watson v. Bersworth, et al.*, 102 U.S. App. D.C. 187, 251 F. 2d 898, and cases cited therein. On the principal issue, then, the District Court had no choice but to base its decision on the Patent Office record.

In dealing with the second issue, professed inherency of the liberation of cork in the Lighthall-Anderson application, the District Court expressly stated that it had considered the appellants' evidence. That evidence was, however, found to be lacking in the conviction required by the authorities.

CONCLUSION

It is submitted that the decision of the District Court in this proceeding is amply supported by the record, that appellants have failed to show error in the refusal of the Patent Office to allow the Heritage patent claims in the Lighthall-Anderson application,

and that the judgment of the District Court should,
accordingly, be affirmed.

Respectfully submitted,

CLARENCE W. MOORE,
Solicitor,
United States Patent Office,
Attorney for Appellee

S. WM. COCHRAN,
Of Counsel.

December 1959

REPLY BRIEF FOR APPELLANTS

IN THE
United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

NO. 15,404

LYLLIAN F. LIGHTHALL, Administratrix et al.,
Appellants

v.

ROBERT C. WATSON, Commissioner of Patents,
Appellee

Appeal From a Judgment of the United States District
Court for the District of Columbia

SPENCER B. MICHAEL
SMITH, MICHAEL & GARDINER
Woodward Building
Fifteenth and H. Streets, N.W.
Washington 5. D. C.
Attorneys for Appellants.

WALTER J. BLENKO
WALTER J. BLENKO, JR.
BLENKO, HOOPES, LEONARD & BUELL
1319 Farmers Bank Building
Pittsburgh 22, Pennsylvania
WM. HENRY VENABLE
Blaw-Knox Company
300 Sixth Avenue
Pittsburgh 22, Pennsylvania
Of Counsel.

January 18, 1960

IN THE
United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

NO. 15,404

LYLLIAN F. LIGHTHALL, Administratrix of the
Estate of Albert C. Lighthall, deceased,
ARTHUR B. ANDERSON,
ALBERT C. LIGHTHALL, JR., Trustee,
and BLAW-KNOX COMPANY,
Appellants,

v.

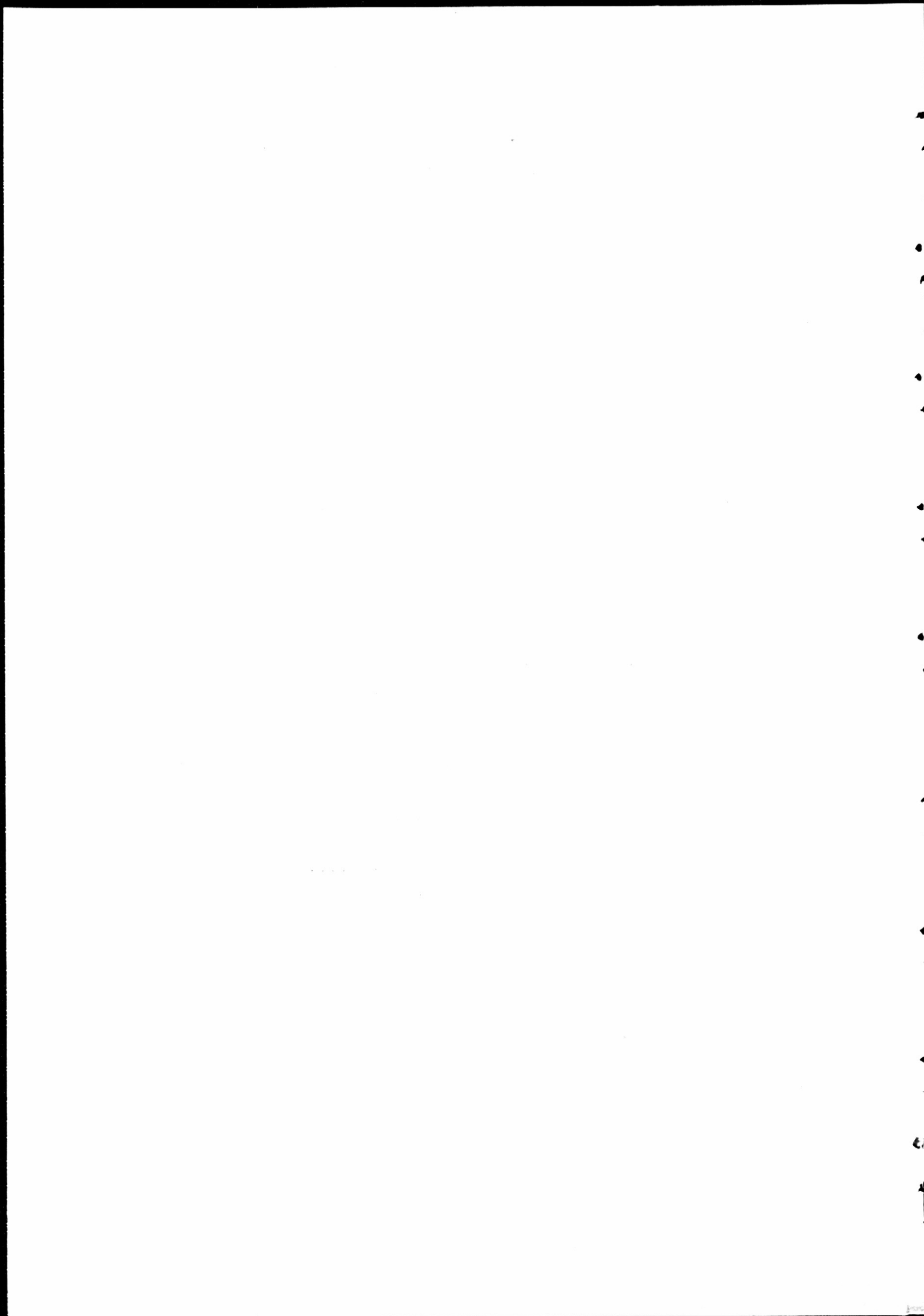
ROBERT C. WATSON, Commissioner of Patents,
Appellee.

TABLE OF CONTENTS

	PAGE
I. The copied claims do not require the presence of cork which has been physically segregated from other substances; so construed, they become meaningless and internally contradictory	1
II. The evidence is conclusive and undisputed that Lighthall-Anderson do inherently disclose the same process as Heritage.....	5
III. The basis of decision below was erroneous....	6

TABLE OF CASES

Grant Paper Box Co. v. Russell Box Co., (C.A. 1, 1946) 154 F.2d 729.....	2
In re Jones, (C.A.D.C., 1929) 58 App. D.C. 379, 30 F.2d 1003	2
Lever Bros. Co. v. Procter & Gamble Mfg. Co., (C.A. 4, 1943) 139 F.2d 633.....	5
Levin v. Coe, (C.A.D.C., 1942) 76 App. D.C. 347, 132 F.2d 589.....	2
Stradar v. Watson, (C.A.D.C., 1957) 100 App. D.C. 289, 244 F.2d 737.....	6
U.S. Industrial Chemicals, Inc. v. Carbide & Carbon Chemicals Corp., (1942) 315 U.S. 668.....	4



REPLY BRIEF FOR APPELLANTS

Nothing in the Brief for Appellee goes outside the questions presented in our main brief. To the contrary, it falls entirely within their scope.

I. The copied claims do not require the presence of cork which has been physically segregated from other substances; so construed, they become meaningless and internally contradictory.

(1) The Brief for Appellee tacitly concedes that there is complete factual identity between the Lighthall-Anderson application and the Heritage patent from which Lighthall-Anderson copied claims for the purpose of an interference. The points of identity throughout both specifications are undisputed and, indeed, are undisputable (Main Br. 11-3).*

(2) Appellee takes the position that the language of the copied claims requires "pure cork" or "cork which has been segregated by a separation step and, accordingly, is not in with other substances" (Appellee's Br. 10). The claims make it clear, however, that the cork particles are in admixture with other substances—both wood and bark particles.

Heritage claim 3 (Lighthall-Anderson claim 30) is illustrative of the product claims (Main Br. 21). It requires only wood particles and particles originating in the bark "including particles of isolated cork". If the word "isolated" is construed to mean cork particles which are "*not* in admixture with other substances"*

* References herein to the "Brief for Appellants" (blue cover) will be "Main Br. —". References to the "Brief for Appellee" (gray cover) will be "Appellee's Br.—".

* Emphasis ours throughout this brief.

Reply Brief for Appellants.

then the claim becomes utterly contradictory and meaningless. It would then require that the cork particles be both *in* admixture with other substances and *not* in admixture with them (cf. JA 56, Col. 4, lines 73-5). Such a construction of the claim is palpably absurd and cannot be supported.

The only alternative construction is that the claim requires the use of cork which was at one time "*not* in admixture with other substances" but which was placed in admixture to form the composition board set forth in the copied claims.* Under this construction, the claim would require that a product be formed including cork particles which *are* in admixture with other substances but which were not in admixture with such substances at a time before the board was formed. It then becomes impossible to tell whether or not the claim is infringed by an inspection of the product for the reason that an essential limitation of the claim involves the operation of machinery by which the product is made. A product claim cannot properly contain limitations as to the operation of the machines used to make the product; *In re Jones*, (C.A.D.C., 1929) 58 App. D.C. 379, 30 F.2d 1003; *Levin v. Coe*, (C.A.D.C., 1942) 76 App. D.C. 347, 132 F.2d 589, 598.

The situation is strikingly like that in *Grant Paper Box Co. v. Russell Box Co.*, (C.A. 1, 1946) 154 F.2d 729. In that case, the claim required a petroleum wax having a suspended colloid. The specification described the addition of colloidal matter to the wax, but the defendant obtained the same result by using a wax having

* It is not clear from the brief whether appellee takes this position or contends that the cork in the claim is *not* in admixture with the other components of the board.

Reply Brief for Appellants.

native colloidal matter. The court held that use of wax with native colloidal material came within the claims and constituted an infringement for the reason that the use of such wax used the principle and appropriated the substance of the invention. In this case, it likewise appears that Lighthall-Anderson obtain every advantage described by Heritage (Main Br. 11-3). Accordingly, they should be permitted to copy the claims to determine priority of invention (Main Br. 17).

(3) Appellee's Brief repeatedly refers to the Heritage patent emphasizing the desirability of using "pure" cork. The use of fully defiberized cork, which is thereby made "pure" by completely dissevering it from the other bark constituents, is also emphasized in the Lighthall-Anderson application (Main Br. 23). We invite a reading of the testimony on this point (JA 23-4). Appellee urges, however, that the term "pure cork" means "cork which has been segregated by a separation step and, accordingly, is not in admixture with other substances" (Appellee's Br. 10). That construction runs contrary to the explicit teachings of the patent. The examples set forth by Heritage and referred to by appellee call for the use of cork which is *in* admixture with other substances. There is nothing to be gained where the cork is again placed in admixture if the advantage of "purity" comes only by physical separation. But it is readily apparent that complete defiberization to fully release the cork from the other bark constituents has a real advantage.

(4) We do not agree that the meaning of the claims can be determined by the remarks of Heritage's solicitor. Expert evidence is properly considered "so

Reply Brief for Appellants.

that the court may be aided in understanding not what the instruments mean but what they actually say", *U.S. Industrial Chemicals Inc. v. Carbide & Carbon Chemicals Corp.*, (1942) 315 U.S. 668, 678. Appellee has, however, referred to remarks of Heritage's solicitor. (Appellee's Br. 15). We think it appropriate, therefore, to note that Heritage's solicitor did not amend the claims to call for "pure" cork, but instead pointed out that they called for cork particles which "are isolated from the remainder of the constituents of the bark, each cork particle [having] its entire surface free and exposed, without attachment to other bark ingredients, whereby its entire surface is available to function as binder for the fibers". Complete defiberization of the bark exposes the entire surface of each cork particle leaving it free to act as binder for both wood and bark fibers. If it was intended to claim cork particles which had been physically separated from the other bark components, as by screening, rather than cork particles whose entire surfaces were fully exposed, the words were poorly chosen.

Reply Brief for Appellants.

II. The evidence is conclusive and undisputed that Lighthall-Anderson do inherently disclose the same process as Heritage.

(1) The Lighthall-Anderson application teaches that the bark be completely defiberized (Main Br. 6-7, 12). Appellee points out that the defiberizing machinery may be adjusted and operated so as to obtain less than complete defiberization. This would come about only by ignoring the teaching of the application and going contrary to the explicit instructions which it contains. But it is clear that the purpose is to obtain true defiberization and the machines are set to achieve this purpose (JA 31). Those skilled in the art can readily understand and follow the teaching; *Lever Bros. Co. v. Procter & Gamble Mfg. Co.*, (C.A. 4, 1943) 139 F.2d 633, 640.

(2) It is clear that the Lighthall-Anderson disclosure fits every requirement of the Heritage. The suggestion that the claims are broader than the application was not raised in the Patent Office but is novel here (JA. 84-6). The cases cited by Appellee are not in point and do not preclude Lighthall-Anderson from making the claims.

Reply Brief for Appellants.

III. The basis of decision below was erroneous.

Even though the lower court stated that it had considered all the exhibits and testimony, the fact remains that it did not reach its own conclusion but was "only concerned with whether the finding of the Patent Office * * * is consistent with the evidence" (JA 96). It did not consider the evidence not before the Patent Office independently for the purpose of reaching its own conclusion on the basis of the fuller record before it. That procedure falls short of the rule set forth by this court in *Stradar v. Watson*, (C.A.D.C., 1957) 100 App. D.C. 289, 244 F.2d 737 and requires reversal.

The judgment of the District Court should be reversed and judgment entered for plaintiffs.

Respectfully submitted,

SPENCER B. MICHAEL

SMITH, MICHAEL & GARDINER

Attorneys for Appellants

WALTER J. BLENKO

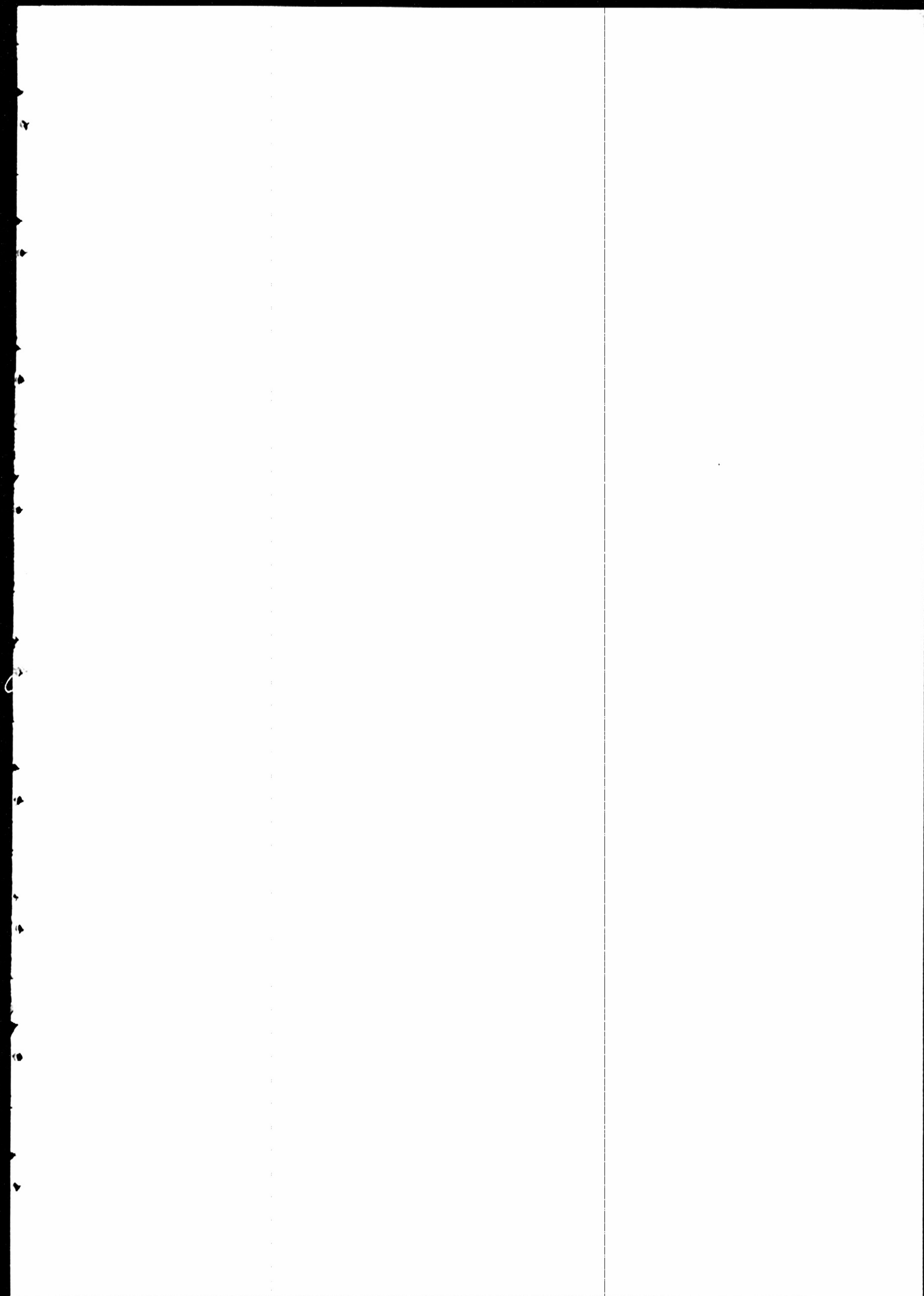
WALTER J. BLENKO, JR.

BLENKO, HOOPES, LEONARD & BUELL

WM. HENRY VENABLE

Of Counsel

January 18, 1960.



159

JOINT APPENDIX

IN THE
United States Court of Appeals
FOR THE DISTRICT OF COLUMBIA CIRCUIT

NO. 15,404

LYLLIAN F. LIGHTHALL, Administratrix et al.,
Appellants

v.

ROBERT C. WATSON, Commissioner of Patents,
Appellee

Appeal From a Judgment of the United States District
Court for the District of Columbia

*United States Court of Appeals
For the
District of Columbia Circuit*

FILED

DEC 1 1959

Joseph W. Stewart

CLERK

TABLE OF CONTENTS

	PAGE
Relevant Docket Entries	1
Complaint	2
Answer to Complaint	5
TESTIMONY	
Dr. Arthur B. Anderson	
Direct Examination	8
Cross Examination	29
Re-Direct Examination	31
Dr. William T. Nearn	
Direct Examination	32
Cross Examination	35
Plaintiffs' Exhibit 1, Excerpts:	
Specification and Drawing in Lighthall-Anderson Patent Application Serial No. 406,319.....	37
Plaintiffs' Exhibit 2:	
Heritage Patent Re. 24,174	55
Plaintiffs' Exhibit 9:	
Photomicrograph of Defiberized Wood and Bark	63
Plaintiff's Exhibit 10:	
Photomicrograph of Ground Douglas Fir Bark	65
Defendant's Exhibit 1, Excerpts:	
Anway Patent 2,437,672	67
Pauley Patent 2,446,551	73
Examiner's Answer	81
Decision of Board of Appeals	84
Defendant's Exhibit 3, Excerpt:	
Amendment From File Wrapper of Heritage Patent Re. 24,174	87
Opinion	93
Findings of Fact	99
Conclusions of Law	102
Judgment	103
Notice of Appeal	103

APPENDIX

Relevant Docket Entries

1957

- Aug. 29 Complaint, Appearance.
- Aug. 29 Summons, copies (1) and copies of Complaint issued Deft ser 8-30-57; Atty Gen. ser 9-2-57; U. S. Atty ser 8-30-57.
- Oct. 17 Answer of deft. to complt, c/mailling, app cw Moore, Solitor filed.
- Oct. 17 Calendered (N).

1959

- May 18 Heard & taken under advisement. Pltffs' brief to be filed within 15 days. Deft. to file reply brief one week thereafter (Reporter R. C. Gore) Sirica, J.
- May 26 Transcript of Proceedings, pp 1-93 (court's) filed
- June 19 Opinion Sirica, J.
- July 8 Findings of Fact and Conclusions of Law (N) Sirica, J.
- July 8 Judgment dismissing complaint with costs against pltff.
- Sept. 2 Notice of appeal by pltfs from order 7-8-59; copies to U. S. Atty., Atty. Gen. and Commissioner of Patents, Deposit \$5.00 by Michael filed
-

*Complaint.***Complaint**

1. This is a Civil Action arising under the patent laws of the United States. This Court has jurisdiction by virtue of Title 28, United States Code §§ 1338(a) and 1391(b), Title 35, United States Code § 145 and Patent Office Rule 304 (37 C.F.R. § 1.304; Title 35, U.S.C.A. App. I, page 743).

2. Plaintiff, Lyllian F. Lighthall, is a resident of Denver, Colorado, and was appointed administratrix of the estate of Albert C. Lighthall, deceased, (hereinafter called "LIGHTHALL") by the County Court of Denver County, Colorado, on October 7, 1950. Plaintiff, Arthur B. Anderson, (hereinafter called "ANDERSON") is a resident of El Cerrito, California. Plaintiff, Albert C. Lighthall, Jr., now also known as Albert C. Lighthall, is a resident of Baker, Oregon. Plaintiff, Blaw-Knox Company, (hereinafter called "BLAW-KNOX") is a Delaware Corporation having a place of business at Pittsburgh, Pennsylvania.

3. Defendant, Robert C. Watson, is Commissioner of Patents, an officer of the United States Department of Commerce.

4. LIGHTHALL and ANDERSON jointly made certain inventions relating to composition boards and made applications to the Patent Office for Letters Patent thereon.

5. By an agreement on October 24, 1949, LIGHTHALL and ANDERSON constituted BLAW-KNOX, then named Blaw-Knox Construction Company, their exclusive agent to negotiate and consummate licenses to use said inventions relating to composition boards. By that agreement, they conveyed certain interests in said inventions

Complaint.

and any patents or patent applications thereon to BLAW-KNOX.

6. LIGHTHALL and ANDERSON each retained an undivided one-half interest in the remainder not assigned to BLAW-KNOX. LIGHTHALL died on July 17, 1950. By action of law and mesne assignments, the undivided one-half interest of LIGHTHALL has been transferred to Albert C. Lighthall, Jr., as trustee for Albert C. Lighthall III, Gary S. Lighthall, Jack N. Lighthall, Jr., and William Lighthall, minor grandchildren of LIGHTHALL and Lillian F. Lighthall.

7. On January 26, 1954, plaintiffs, Lillian F. Lighthall, administratrix, and ANDERSON filed an application for Letters Patent for "Composition Boards Containing Douglas Fir Bark", Serial No. 406,319, which application is a continuation in part of an earlier application made by LIGHTHALL and ANDERSON and referred to above. Application Serial No. 405,319 is now pending in the Patent Office.

8. On February 28, 1956, the Patent Office issued patent 2,736,063 for "Cork-Bound Hot-Pressed Boards" to Clark C. Heritage, (hereinafter called "Heritage") which patent was reissued as patent Re. 24,174 on July 3, 1956.

9. Inventions disclosed and claimed in said Heritage patents are identical with inventions disclosed and claimed in said application Serial No. 406,319. On April 17, 1956, pursuant to Patent Office Rule 205, claims 1 to 8, 12, 15, 17 and 19 of Heritage patent 2,736,063 were copied into said application Serial No. 406,319 as claims 14 to 25 for purposes of interference.

Complaint.

10. The claims allowed to Heritage were incorrectly printed in patent 2,736,063 and application was made for reissue of patent 2,736,063 to correctly state the claims which were allowed to Heritage. On June 4, 1956, claims 14 to 25 of application Serial No. 406,319 were canceled and new claims 28 to 39 were presented. Claims 28 to 39 are claims originally allowed to Heritage but which were printed incorrectly in patent 2,736,063. Claims 28 to 39 of application Serial No. 406,319 subsequently appeared as claims 1 to 8, 12, 15, 17 and 19 of Heritage patent Re. 24,174.

11. The Patent Office examiner refused to allow claims 28 to 39 or to declare an interference between application Serial No. 406,319 and Heritage patent Re. 24,174, and his action was appealed to the Board of Appeals of the Patent Office. The Board of Appeals affirmed the examiner. A timely Petition for Reconsideration was denied by the Board of Appeals on July 31, 1957.

12. The actions of the Patent Office in refusing to allow claims 28 to 39 of application Serial No. 406,319 and to declare an interference with Heritage patent Re. 24,174 were erroneous. By this action, plaintiffs seek to compel the defendant to allow said claims and declare the interference.

Concurrently with the commencement of this action, applicants are filing a new application for "Composition Boards Containing Douglas Fir Bark", which application is a continuation of application Serial No. 406,319. Claims 23 to 34 of the new application are identical to claims 28 to 39 of application Serial No. 406,319, which are the subject matter of this action. Claims 23 to 34 of the new application correspond to claims 1 to 8, 12, 15, 17

Answer to Complaint.

and 19, respectively, of Heritage patent Re. 24,174. They are presented in the new application to keep them pending before the Patent Office pending disposition of other claims in the application.

WHEREFORE, PLAINTIFFS PRAY:

(1) For a judgment that the inventions of claims 28 to 39 of application Serial No. 406,319 are disclosed by that application;

(2) For a judgment directing defendant to allow claims 28 to 39 of application Serial No. 406,319 for the purposes of interference and to declare an interference between said application and Heritage patent Re. 24,174;

(3) For such other and further relief as is just and proper in the premises.

Answer To Complaint

To the Honorable the Judges of the United States District Court For the District of Columbia.

1. The defendant admits that this is a Civil Action arising under the patent laws of the United States. The defendant also admits that this Court has jurisdiction by virtue of Title 35, United States Code § 145 and Patent Office Rule 304 (37 C.F.R. § 1.304; Title 35, U.S.C.A. App. I, page 743). The defendant denies, however, that this Court has jurisdiction by virtue of Title 28, United States Code §§ 1338(a) and 1391(b).

2. The defendant admits that plaintiff, Lyllian F. Lighthall, is a resident of Denver, Colorado, and was appointed administratrix of the estate of Albert C. Lighthall, deceased. The defendant asserts that he is without

Answer to Complaint.

knowledge or information sufficient to form a belief as to the truth of the allegation that plaintiff, Lyllian F. Lighthall, was so appointed administratrix by the County Court of Denver County, Colorado, on October 7, 1950. The defendant also admits that plaintiff, Arthur B. Anderson, is a resident of El Cerrito, California. The defendant asserts that he is without knowledge or information sufficient to form a belief as to the truth of the remaining allegations of paragraph 2 of the complaint.

3. The defendant admits the allegations of paragraph 3 of the complaint.

4. The defendant admits that LIGHTHALL and ANDERSON made applications to the Patent Office for Letters Patent on composition boards. The defendant asserts that he is without knowledge or information sufficient to form a belief as to the truth of the allegation that LIGHTHALL and ANDERSON jointly made certain inventions relating to composition boards.

5, 6. The defendant asserts that he is without knowledge or information sufficient to form a belief as to the truth of the allegations of paragraphs 5 and 6 of the complaint.

7, 8. The defendant admits the allegations of paragraphs 7 and 8 of the complaint.

9. The defendant admits that claims 1 to 8, 12, 15, 17 and 19 of Heritage patent 2,736,063 were copied into application Serial No. 406,319 as claims 14 to 25 for purposes of interference. The defendant denies, however, that said claims were so copied on April 17, 1956, and also denies that such copying was pursuant to Patent Office Rule 205. The defendant additionally denies that

Answer to Complaint.

the inventions disclosed and claimed in Heritage patents 2,736,063 and Re. 24,174 are identical with inventions disclosed and claimed in application Serial No. 406,319.

10, 11. The defendant admits the allegations of paragraphs 10 and 11 of the complaint.

12. The defendant denies that the actions of the Patent Office in refusing to allow claims 28 to 39 of application Serial No. 406,319 and to declare an interference with Heritage patent Re. 24,174 were erroneous. The defendant admits the remaining allegations of section 12 of the complaint.

FURTHER ANSWERING, the defendant asserts that claims 28 through 39 of application Serial No. 406,319 correctly were refused allowance therein, for the reasons given in the Examiner's action dated July 24, 1956, the Examiner's final rejection, the Examiner's answer and the decisions of the Board of Appeals in that application. Profert of copies of said action, final rejection, answer and decisions is hereby made.

Dr. Arthur B. Anderson—Direct.

Testimony

[19] DR. ARTHUR B. ANDERSON was called to the stand as a witness by counsel for the Plaintiff, and having been first duly sworn, was examined, and testified as follows:

DIRECT EXAMINATION

By Mr. Blenko (Sr.)

[20] Q Please state your name. A Arthur B. Anderson.

Q And where do you live? A I live at 2305 Cedar Street, El Cerrito, California.

Q What is your present professional association, Doctor? A I am with the Forest Products Laboratory of the University of California, and my position is Chief of the Wood Chemistry Division.

Q Where were you educated? A I received my Bachelor of Arts Degree from the University of Wisconsin in 1929, and a Ph.D. in 1933 from the same University, the degree granted in organic chemistry.

* * * * *

Q What did you do after you got your Doctor's degree from the University of Wisconsin? A I joined the Quaker Oats Company and worked for them for a period of six years. In 1940 I went with the Western [21] Pine Association in Portland, Oregon as Chief Chemist in the Research Laboratory. I worked there for eight years and then I joined the Oregon Lumber Company in 1948, and worked with the Oregon Lumber Company until 1950, after which I joined the University of California.

Q And you have been there ever since? A Yes, where I hold my present position.

Dr. Arthur B. Anderson—Direct.

Q What has been the nature of your work in these associations, with the Western Pine Association, the Oregon Lumber Company and the University of California? A My work was principally concerned with the chemical composition of trees, wood, and the problems associated in the forest products industry, particularly lumber, such as seasoning by chemical process. And then with the Oregon Lumber Company we worked on the utilization of Douglas fir bark in the hardboard compositions.

Q Have your researches taken you into any foreign country? A Yes. In 1956 and 1957 I was on a Fulbright Research Scholarship in Oslo, Norway, working at the—

* * * * *

[22] *The Witness*:—Norwegian Pulp and Paper Institute, and my project there dealt with the utilization of Scandinavian barks in hardboard compositions.

By Mr. Blenko:

Q Have you had occasion to deal with the wood called Douglas fir in your researches? A Yes, indeed.

Q Is Douglas fir indigenous to any particular country or location?

* * * * *

A It is largely confined, of course, to the West coast, West coast states of the United States and in Canada.

Q Is it a tree that appears extensively or is it a rare tree? [23] A It is a very common tree out on the West coast.

Q What is the size and age of these trees? A Well, they will vary from seedlings to giants that may be three or four or five feet in diameter at breast height

and they may be five, six or seven-hundred years old, a mature Douglas fir.

Q Is Douglas fir a significant wood of commerce?

A Yes, it is one of the leading species used out on the West coast both for lumber manufacture, plywood, and in pulp and paper.

Q Is it a coniferous tree? A Yes, it is.

Q After a Douglas fir tree has been felled what is normally done with it to convert it into lumber? A It is hauled away usually in trucks or railroad cars to the plant, and if this plant has a pond where the logs can float they are put in the pond and then they are taken up on a conveyor to what we call the head rig, the head saw, and usually this cant, as they call it, is squared. Since lumber is square, rectangular, and unfortunately a log is round, they must take off the outer portion of the log to square it, and this is what constitutes the slashings and edgings.

The Court: Doctor, are those the kind of trees found [24] around Yosemite?

The Witness: Yes, they do have Douglas fir in Yosemite, but they also have the Sequoia redwood there which are probably the oldest living things in the world, the giant Sequoia redwood.

The Court: I have been through Yosemite so I have a picture of some of those trees that you speak of.

By Mr. Blenko:

Q Now, is any significant amount of bark tolerated on the tip of the lumber itself? A No, it must be bark-free, of course.

Q Does the bark appear on these slabs and edgings? A Yes, indeed.

Dr. Arthur B. Anderson—Direct.

Q What has been done with those things, generally. A Generally speaking, they were used as a source of fuel, or they were put into conveyors and what we call waste burners.

Q Have you brought to this courtroom some specimens of Douglas fir bark, at my request? A Yes, sir.

Q Will you please produce them? A I have two specimens of Douglas fir bark here.

* * * * *

[25] Q Doctor Anderson, I have now had these two specimens marked for identification as plaintiff's exhibits 3 and 4 respectively. Will you please examine those with their tags and tell the Court where they came from in the living tree, what part of the tree? A Exhibit 3, this is the Douglas fir bark, and it is a homegenous mixture containing some cork tissue—

Q Just a moment, Doctor. I want you to identify those simply from the point of their location in the tree. I will go into detail later.

The Court: You mean whether it came from the top of the tree or the bottom?

Mr. Blenko: Yes, your Honor.

The Witness: In looking at exhibit 3 I would say this came from the top portion of the tree, and exhibit 4 from the butt portion of the lower portion of the tree.

By Mr. Blenko:

Q Now, I want to talk about the anatomy of the bark as represented by those specimens, and I think I shall ask you to look at exhibit 4 for identification first. Will you please state to the Court, and perhaps you could hold it up so his Honor could see it, what the detailed structure of that bark is, what are the components and

Dr. Arthur B. Anderson—Direct.

so forth? A This bark contains, as you can see, some very heavy [26] light areas, and quite thick, and this constitutes the cork tissue of the bark. In between you will see this dark brown area and it consists largely of bast fiber and amorphous material.

The Court: Let me ask a question. How thick is this bark on a tree you are talking about?

The Witness: This will vary, of course, upon the size of the tree, but this is the thickness of a butt bark of, I would say, a medium mature tree.

Mr. Blenko: That is somewhere in the neighborhood of an inch and a half?

The Witness: I would say so.

The Court: That is the actual thickness of the bark you have been talking about?

Mr. Blenko: Yes.

The Court: And underneath the bark what do you find?

The Witness: When the bark is stripped you get into the cambium layer.

The Court: Is that what they make the lumber out of?

The Witness: This is the synthetic point—

Mr. Blenko: I think I can put a question to the witness that will develop that a little further.

By Mr. Blenko:

Q The Court has asked you about the thickness of the bark and we have developed that now by reference

Dr. Arthur B. Anderson—Direct.

to these two samples. [27] The next question was what was immediately inside the bark. Just name it. A The cambium layer.

Q Is that very thick? A It is extremely narrow. I mean it is a very minute part of the whole tree.

Q Something you would measure in hundredths or thousandths of an inch? A Yes.

Q What is inside the cambium layer? A The parenchyma cells, which is the woody portion of the tree.

Q So, what is inside the cambium layer is the wood? A Yes, indeed.

Q That we call Douglas fir? A Yes, indeed.

Q Now, the next question was how do you remove the bark, and I think you had best deal with that in terms of what happens in a lumber mill.

The Court: Maybe that is not important for this case.

Mr. Blenko: I think it will be helpful, your Honor.

The Court: I want to get a mental picture of the process of what they do.

The Witness: In the process of making lumber from Douglas fir, as I have indicated, they put the whole log or the cant on a [28] head rig and square the log, and of necessity the bark comes off at this time. It is the outer portion of the tree.

By Mr. Blenko:

Q Does the bark adhere to the slabs? A Quite tenaciously. Sometimes it may fall off but it usually hangs on pretty well.

Dr. Arthur B. Anderson—Direct.

Q Is there a term in the lumber art called "debarking"? A Yes, there are certain machines, certain hydraulic debarking machines, where they use a high pressure nozzle and they play the water, which is of great pressure, on the log as it rotates and the pressure is so great that it tears the bark away from the wood portion of the log. They also have purely mechanical pressure in rolls that they also use to remove the bark.

Q Is that something that is ordinarily done in commercial lumbering operations? A Some have been installing the debarkers because they want bark—debarked slabs and edgings for the pulp mill.

Q Tell us a little more about that. What do you mean by "pulp for the pulp mill?" A Well, for making newsprint and chemical cellulose, if you please, and they must remove all the bark. Sometimes these mills will purchase a debarker so that they can recover the wood portion of the log that was formerly wasted in the form of chips.

Q Now, I want to get back to plaintiff's exhibit 4 for [29] identification, and deal a little bit more with the anatomy of the bark. I am holding the exhibit in my hand, Doctor Anderson, with the thumbtack which holds the tag on the uppermost face. Now, so held, does that correspond to the positioning of the bark on the tree? A Yes, the portion to my left is the inner portion. This is adjacent to the wood itself, or the cambium layer, and the outer portion is where you see the large scale, and that is the outer portion of the bark, the outer area of the bark as it appears on the tree.

Q Of course, the coarse convex surface is the outer surface? A Yes, indeed.

Dr. Arthur B. Anderson—Direct.

Q And the cambium layer is the generally convex and quite irregular surface? A Yes.

Q Now, looking at it from the top, do we see something that would be generally a horizontal cross section of the bark? A Yes, there would be a horizontal cross section of the bark.

Q Looking at it on the side do we see a vertical section? A Yes, that is the vertical section.

Q If I understand you correctly the light colored portions, almost cream-colored with a little tinge of brown in them, are called what? [30] A That is the cork tissue.

Q And what are the darker brown laminations that appear in between? A This area consists largely of bast fiber and amorphous material.

Q What is meant by "bast fiber"?

The Court: How do you spell that?

The Witness: B-A-S-T. These are terms that were introduced in the Heritage patent which describe this portion by the Latin name, and I think that you have—I don't have a copy here, but in our work and so on we do not call these things by their generic name or so-called Latin name when we are dealing with them, when we are concerned with the composition as a whole.

By Mr. Blenko:

Q Are you now familiar with the term sclerenchyma and parenchyma? A Yes.

Q Where are the components just named found in the bark of Douglas fir, as exemplified by Exhibit 4? A These constituents are found in the darker brown area between the cork tissue layers.

Q Is there a term in the lumber art called "debarking"? A Yes, there are certain machines, certain hydraulic debarking machines, where they use a high pressure nozzle and they play the water, which is of great pressure, on the log as it rotates and the pressure is so great that it tears the bark away from the wood portion of the log. They also have purely mechanical pressure in rolls that they also use to remove the bark.

Q Is that something that is ordinarily done in commercial lumbering operations? A Some have been installing the debarkers because they want bark—debarked slabs and edgings for the pulp mill.

Q Tell us a little more about that. What do you mean by "pulp for the pulp mill?" A Well, for making newsprint and chemical cellulose, if you please, and they must remove all the bark. Sometimes these mills will purchase a debarker so that they can recover the wood portion of the log that was formerly wasted in the form of chips.

Q Now, I want to get back to plaintiff's exhibit 4 for [29] identification, and deal a little bit more with the anatomy of the bark. I am holding the exhibit in my hand, Doctor Anderson, with the thumbtack which holds the tag on the uppermost face. Now, so held, does that correspond to the positioning of the bark on the tree? A Yes, the portion to my left is the inner portion. This is adjacent to the wood itself, or the cambium layer, and the outer portion is where you see the large scale, and that is the outer portion of the bark, the outer area of the bark as it appears on the tree.

Q Of course, the coarse convex surface is the outer surface? A Yes, indeed.

Dr. Arthur B. Anderson—Direct.

Q And the cambium layer is the generally convex and quite irregular surface? A Yes.

Q Now, looking at it from the top, do we see something that would be generally a horizontal cross section of the bark? A Yes, there would be a horizontal cross section of the bark.

Q Looking at it on the side do we see a vertical section? A Yes, that is the vertical section.

Q If I understand you correctly the light colored portions, almost cream-colored with a little tinge of brown in them, are called what? [30] A That is the cork tissue.

Q And what are the darker brown laminations that appear in between? A This area consists largely of bast fiber and amorphous material.

Q What is meant by "bast fiber"?

The Court: How do you spell that?

The Witness: B-A-S-T. These are terms that were introduced in the Heritage patent which describe this portion by the Latin name, and I think that you have—I don't have a copy here, but in our work and so on we do not call these things by their generic name or so-called Latin name when we are dealing with them, when we are concerned with the composition as a whole.

By Mr. Blenko:

Q Are you now familiar with the term sclerenchyma and parenchyma? A Yes.

Q Where are the components just named found in the bark of Douglas fir, as exemplified by Exhibit 4? A These constituents are found in the darker brown area between the cork tissue layers.

Dr. Arthur B. Anderson—Direct.

Q Can you observe any physical distinction of them with the naked eye? A Yes, you will actually see some fibrous material in the [31] dark brown area.

Q The lightish color? A Yes, and it is very brittle. These fibers are brittle in contrast to the cork tissue which has no fiber.

Q These are defined as thread-like? A Yes, thread-like, I would say.

* * * * *

The Court: You say the light part here is cork?

The Witness: That is right.

The Court: What is the brown part?

The Witness: The brown part is the bast fibers and amorphous material.

By Mr. Blenko:

Q Now, in the interest of completeness, Doctor Anderson, I will ask you to refer to Plaintiff's Exhibit 3 for identification, which you have told us comes from the higher portion of the trunk, higher up in the trunk than the bark of the kind exemplified by Exhibit 4 for identification—is that right? [32] A Yes, sir.

Q Tell us whether the anatomy of the bark, exemplified by exhibit three, is the same as or different from that of exhibit four. A Well, the component parts are the same, but the thing that is quite obvious just from a casual observation of these, the one that is taken from the bottom portion of the tree contains a much heavier or greater concentration of cork tissue, and as you go up the tree the cork content of the bark gradually decreases.

Dr. Arthur B. Anderson—Direct.

Q What percentage of the bark of Douglas fir is cork tissue? A The percentage of cork in Douglas fir bark, the minimum is about 25 per cent of the total weight and may go beyond 50 per cent of the total weight of the bark. In other words, over half of the total bark of Douglas fir may be cork tissue.

Q And in any case it will be no less than 25 per cent? A No less than 25 per cent, yes.

Q Doctor Anderson, what are the constituents of the cork itself? A The cork is very rich in extractive components consisting largely of wax.

Q Have you ever extracted wax from the cork of [33] Douglas fir? A Yes, sir; I have.

Q And can you produce a sample of such wax? A Yes.

* * * * *

(A jar and its contents were marked Plaintiff's Exhibit No. 5 for Identification.)

By Mr. Blenko:

Q You have produced a jar containing some broken lump-shaped material which I have had marked for identification as Plaintiff's Exhibit No. 5. Now, what is that? A It is a sample of Douglas fir wax, a sample of wax from Douglas fir bark.

Q This, as I understand, was removed in the laboratory by some organic solvent? A Yes, we used a benzene from the broken down cork cells of Douglas fir bark. First we extracted that with benzene and this is the residue we had after removing the benzene, or evaporating it.

Q Suppose you were to heat that wax; what would happen? A It has a relatively low melting point of

Dr. Arthur B. Anderson—Direct.

about 135° F. In other words, it is very thermoplastic. It flows when heated very, very readily.

Q Is this wax component of Douglas fir bark cork [34] water resistant? A It is extremely water resistant.

Q Now, we have ascertained that the cork component of Douglas fir bark contains waxes. A Yes.

Q What else is there? In other words, after you have extracted the wax in your laboratory what is the residue? A We have left the cork tissue free of extractive components. It is a tissue, and upon further examination of this we usually find that by wood chemistry methods that this consists perhaps largely of lignin.

Q Going back to Plaintiff's Exhibit 4 for identification, are we to understand that the whitish laminations in there that you have designated as cork tissue consist of lignin and the waxey material, exemplified by Exhibit No. 5? A Yes, and there also may be some amount of cellulose, but—

The Court: How is this wax separated from the bark? What is the process it goes through?

The Witness: This wax can be produced from the Douglas fir bark that has been rounded and "trish" milled, and it is put in an extractor and extracted by solvent of benzene—

[35] *The Court:* By heating it?

The Witness: By extracting it with solvent. It is similar to where you are making coffee by percolating it, where the grinds represent the bark and the water represent the solvent, which passes over the bark, and

Dr. Arthur B. Anderson—Direct.

in passing the solvent over the bark you remove this wax.

By Mr. Blenko:

Q. Now, in the manufacturing of hardboards, as described in your Lighthall-Anderson application here involved, is there any extraction of wax by solvents?

A As it is used in the process that we are now using?

Q That is the question. A No, sir. We use the whole bark and it has not been extracted with a solvent.

Q This specimen, exhibit 5 for identification, is simply to show the chemistry of the bark, is that right?

A That is right.

Q You are one of the applicants to the Lighthall-Anderson application here involved, is that correct?

A Yes.

Q Is Mr. Lighthall, your co-applicant living or dead? A He is dead. He died in July of 1950.

Q I have put into evidence as exhibit 1 a copy of the Lighthall-Anderson application. Have you at my request recently re-examined that? [36] A Yes, sir.

Q There are contained in it a number of descriptions of procedures and a number of examples. Are they actual procedures and actual examples? A Yes, sir.

Q Representing work actually done by you and Mr. Lighthall? A Yes, sir.

Q Was a commercial plant ever installed to make hardboard using Douglas fir bark following your Lighthall-Anderson disclosure? A There was such a plant installed at Dee, Oregon, a small place about 70 miles from Portland, Oregon, and there was installed by the Oregon Lumber Company at Dee, Oregon a plant, and

Dr. Arthur B. Anderson—Direct.

this used the unbarked slabs and edgings as sole raw material for producing this product.

Q Did you participate in the development at that plant, and have you seen it in operation? A Yes, sir, I have.

Q Was hardboard produced there using Douglas fir bark as one of its constituents? A Yes, that is right, sir.

Q And can you produce some samples of that hardboard as produced at Dee, Oregon? A Yes, indeed. [37] (Samples of hardboard were marked as Plaintiff's exhibit number 6 for identification.)

* * * * *

Mr. Blenko: As your Honor will see, they are quite dense and strong.

The Court: I notice they have different designs.

Mr. Blenko: That is right.

Q I have had the specimens marked for identification as plaintiff's exhibit 6, and I would like for you to refer briefly to one or two of them. The top one, as I hold them, is marked "alwood hardboard". What is the significance of the word "alwood?" A Well, it was the name thought up to indicate that the whole tree is used, the bark as well as the wood.

The Court: Will you repeat that please?

The Witness: This trademark "alwood", the connotation there is that it employs not just the wood of the tree but also the bark.

The Court: Thank you.

By Mr. Blenko:

Q The top sample in this series has a thickness given as $\frac{3}{16}$ of an inch thick. One side is quite different surface [38] wise from the other. A Yes, sir.

Dr. Arthur B. Anderson—Direct.

Q Will you state how that comes about? A After the mixture of the bark pulp and wood pulp are formed into a wet sheet, it is put on a caul plate containing screening in the bottom plate.

Q And this rough side is the screen side? A Yes, the screen side. And on the top they put a stainless steel plate to give the top surface this smooth finish. This is put into a hot press and consolidated, and the reason why they have the screen on the bottom caul plate is to allow the water to flow from the mat.

Q What was the adjective you used in front of the word "plate?" A Caul. That is a term used—this caul plate is used in the hot press when things are consolidated as hardboard is.

Q Now, by properly configuring the caul plates, can you alter the character of the surfaces of the board? A Yes, this is how some of those patterns are made, They actually etch the upper caul plate to various designs and then press them out as you see the finished board here.

Q I would like to go into a little more detail of the procedures followed in the making of the hardboard at Dee, Oregon, Doctor Anderson, and I am going to refer you first to [39] paragraph 9, to page 9 of plaintiff's exhibit 1, which is a copy of the Lighthall-Anderson application. A At the top of page 9?

Q The second full paragraph commences in these terms; "In making the presently described bark-containing consolidated products, the bark and wood or other lignocellulose material first are reduced to fiber or equivalent finely divided form. This is desirable in order to secure an intimate mixture of the bark and lignocellulose material particles, to take full advantage of the

water repellent characteristic of the bark and to form a consolidated product presenting a substantially uniform exterior surface." Now, I want to go back over that and deal with a few words. What is the significance of the phrase "other lignocellulose material?" A Well, this may constitute other plant materials such as corn or straw, but the bark or wood or other such lignocellulose material might even include bagasse from cane sugar.

Q To come back to the case we were talking about, slabs and edgings of Douglas fir with the bark remaining, what portion of that is lignocellulose material?

A As defined, it is the wood portion of the slab, that is, anything of cellulose material.

Q What is meant by "reduced to fiber?" [40]

A The material is the aggregate, of course, to the form of chips and these must be broken down to a fine form, and this material is defiberized by certain apparatus or machinery.

Q I think we had better take that in steps. I ask you to turn to page 10, plaintiff's exhibit 1, the second full paragraph which commences with the words "Before defiberization." That reads, "Before defiberization the wood may be subjected advantageously to a preliminary steaming operation in order to soften it." Is that a routine operation in the treatment of forest products?

A Yes, in making fibrous material this is the usual treatment, yes.

Q The paragraph continues: "Thus in one mode of operation Douglas fir slab wood—

* * * * *

Q Now, do you have any samples of slab wood after it has been reduced to chip form? A Yes, sir.

Dr. Arthur B. Anderson—Direct.

Q. Will you please produce it?

* * * * *

[41] (The envelope containing wood chips was marked plaintiff's exhibit no. 7 for identification.)

By Mr. Blenko:

Q I think the nature of the chips contained in the envelope is almost self-evident, Doctor Anderson, but will you simply, for illustrative purposes now, select chips which consist of wood particles attached to bark?

A I have here the wood chip that is free of any bark, and I have here a bark chip which has no wood attached to it, and this is Douglas fir bark. As you can see, we can see the typical cork tissue layers in the bark. It is very evident. And here I have a particle or aggregate which contains bark attached to wood, which indicates that this material came from unbarked slabs and edgings.

Q You have spoken of defiberization. Would the chips that constitute exhibit 7 for identification be properly described as defiberized material? A This material that we have here in this envelope is not defiberized material. It is chipped material.

Q What is done with the chipped material in order to defiberize it? A It is put through an attrition type of mill where you have serrated plates that are quite close together, and one of [42] them rotates and they have a pre-steaming chamber where they put these chips and let them steam for various lengths of time. Then they are blown in under pressure into this "trish" mill and then ground or defiberized, as the term is used, into component parts, and the wood aggregate is broken down to sometimes its individual fibers, the cork tissue

Dr. Arthur B. Anderson—Direct.

in turn is also broken down into its component parts and the cork is separated from the bast fibers and amorphous material.

Q Is there a severance of the cork component of the bark from the other components? A Yes, indeed.

Q And is there also a severing of the lignocellulose fibers in the wood, one from another? A Yes, indeed.

Q Can you produce a specimen of the material after it has been defiberized? A Yes, sir.

Mr. Blenko: The witness has handed me an envelope which seems to have some signs of wear on it. Is the label on it in your handwriting?

The Witness: Yes.

Mr. Blenko: What does it say?

The Witness: "Sample of wetlap taken from Oregon Lumber Company, Hardboard Plant at Dee, Oregon, Monday, November 14, 1955," and this was put in a Streamliner envelope on the [43] train when I was approaching Pittsburgh at the time.

(The envelope, with its contents, was marked Plaintiff's Exhibit No. 8 for identification.)

By Mr. Blenko:

Q I have had the envelope marked as Plaintiff's Exhibit No. 8, Doctor Anderson. I will now ask you to look at the material contained in the envelope and state for the record generally what its character is. A This is a defiberized material containing a mixture of wood and bark, and it is possible to see some of the pulp, on some of the pulp you can see the individual threads of fiber or the trachea of the tree, and you can also find some

Dr. Arthur B. Anderson—Direct.

very fine powdery material in there that may be a portion of wood fiber that has been cut further down, or it may be a portion of the amorphous material that is in the bark and it may also include cork particles disbursed throughout the fiber aggregate.

Q Are all of the constituent parts of the bark present in this specimen? A Yes, all of the component parts of the bark would be present, but in the case of Douglas fir bark the largest portion of the cork particles, or tissue, remains with the fiber. And upon grinding this material, in the preparation of this pulp mixture, some of the bast fibers and amorphous material, which is so fine, will pass through the screen and it goes out as effluent in the water.

Q And is the name of that screen that it passes through called a Fourdrinier screen? [44] A That is correct.

Q And is that a certain type of board-making machine? A Yes.

Q The Fourdrinier screen is a wire screen? A That is right.

Q Upon which the wet pulp is laid so that the water may drain off? A Yes.

Q To effect a preliminary felting operation? A Yes, sir.

Q You say in the course of that, the water, as it drains out, may carry some of these extreme fines out? A Yes.

Q But the cork essentially remains in? A Yes. In the process of defiberizing Douglas fir bark alone, the largest particles that result when we are through are the cork tissue because they are quite pliable and don't cut as readily as the bast fiber and hence form the larger

portion of it. This can be put through plates of very close proximity and ground finer too, but the cork stays in the wetlap of the board formation.

Q You have told us about the grinding together of wood and bark after chipping, as described in the Lighthall-Anderson application. What effect does that defiberization of the two constituents at the same time have upon the distribution of the cork particles through the mass? [45] A In the process of disintegration in this manner we get a very uniform distribution of the cork tissues throughout the wetlap area.

* * * * *

Q You have described for us and produced samples showing the manner of defiberating the wood in the Douglas fir bark for the purpose of making this defiberated material that is placed on the Fourdrinier screen. My question is, are the cork particles attached to the other bark ingredients or are the cork particles severed from the other bark ingredients as a result of the treatment that you have told us about? A By the very nature of the process and the anatomy of bark, the cork must be separated from the rest of the bark components.

* * * * *

[46] *By Mr. Blenko:*

Q. I think we have touched upon it from time to time, Doctor Anderson, but so as to get it all in one place I will ask you to take us very quickly through the procedure steps following the placing of this wet mat on the Fourdrinier screen in order to arrive at a hardboard as exemplified by Plaintiff's Exhibit 6. A There is one point that I think perhaps I did not bring in a little bit earlier and that was this: that when you are making a wallboard out of a hundred percent wood,

Dr. Arthur B. Anderson—Direct.

which is the normal art, after you defiberize it and put it in a slurry you add what is called in the trade a sizing agent, which may be [47] rosin or wax or some other component, and this is mixed in with this pulp slurry so that upon consolidation the resulting product will not pick up water. It will not absorb as much water, and this is the art, or the essential steps in making of wallboard.

Now, to give you an example of what would happen if you did not include this rosin or wax size in the pulp, or prior to consolidation, you would end up with a product comparable to blotting paper. It would pick up moisture very readily, and this is the function of sizing agents in fiber product production.

Now then, in the process of Oregon Lumber Company, where we are employing Douglas fir bark as a constituent, we do omit this sizing step prior to forming the wetlap, because we found for the first time that Douglas fir bark contains its own natural sizing agent, which was demonstrated by the—I have forgotten the exhibit number, but this is in the main how the process as used by the Oregon Lumber Company differs from other plants producing wallboard or hardboard.

Now then, I wish to go on, in answer to counsel's question. After the wetlap has formed, this material is conveyed into a hot press, and then the pressure is closed on the wetlap with temperature also employed. The time involved is contingent upon the material used and the thickness of the board to be produced. Then, after it has been heated for a proper length of time under pressure, the pressure is released and the boards are removed from the hot press. These are cooled down

to room [48] temperature and sometimes put in humidifying chambers to get them up to certain moisture content desirable before sale.

Q Is the temperature employed in the hot press a temperature sufficient to make the cork component thermoplastic? A Yes, indeed. Since the cork component is thermoplastic and has a relatively low melting point, as previously indicated, about 135 degrees Fahrenheit or roughly 58 to 60 degrees centigrade, we employ in the hot presses temperatures way above this and we will use pressures up to 250 or even 500 or 600 pounds of steam pressure in the platen where the temperature may go to 450 or 500 degrees Fahrenheit.

Q Does the cork component flow into bonding admixture with the fibrous components? A Yes, it will flow under these conditions of temperature and heat.

Q I want to take you back now to Exhibit 1, the Lighthall-Anderson application, commencing at the top of page 10. It is there stated that the reduction of the lignocellulose and bark may be effected in any suitable type of apparatus. Preferably it is carried out in defiberizers such as the Allis-Chalmers, the MacMillan, the Bauer or the Asplund. What do these words mean? A There are various machines that are used to disintegrate a chipped form of wood and/or bark and it reduces them down to their component parts.

[49] Q Are those types of machines in common use today? A Yes, they are used extensively throughout the wallboard industry and the pulp and paper business.

Q Were they in common use in 1946? A Yes, indeed.

Q Referring to page 8 of Plaintiff's Exhibit 1, I find about midway down in the first paragraph the state-

Dr. Arthur B. Anderson—Cross.

ment that "To obtain maximum advantage of the use of the bark it should be incorporated," and I now quote, "In amounts of from 20 to 50 percent by weight based upon the dryweight of the final product." Do you see that? A Yes, sir.

Q What does that 20 to 50 percent bark weight correspond to in terms of percentage of the cork component? A In the case of where we have a 20 percent Douglas fir bark the product would contain a minimum of 5 percent cork tissue.

* * * * *

[50] (Plaintiff's Exhibits 3 thru 8 incl. previously marked for identification were received in evidence.)

* * * * *

CROSS EXAMINATION.

By Mr. Cochran:

Q Doctor Anderson, what is meant by the word conifer? A Conifer denotes a so-called soft wood species in contrast to the hard wood species.

Q Douglas fir is a conifer? A Yes, it is.

Q Are there other conifers? A Yes, indeed.

Q Many others? A Yes.

Q Can you give us an example or two? A Well, the Southern pines, the sugar pines, Jeffery pine, the white fir, red fir, and redwood are all of this class [51] of conifer or soft wood.

Q In your application, which is here in issue, is there any suggestion that the bark of any tree other than Douglas fir can be used? A We dealt entirely in our application with Douglas fir because it gave us this result, unanticipated result, of having a constituent acting as a sizing agent. We did run just in a preliminary

way tests on barks on other trees of coniferous nature, such as the Southern pines, the red fir and the sugar pine. We found that neither of these barks had the sizing properties comparable to that exhibited by Douglas fir.

Q In answer to my question, you did limit your disclosure in your application to Douglas fir? A For this present application, yes, sir.

Q You mentioned that the reduction of the bark and wood could be carried out in a device known as an attrition mill? A Yes.

Q Did you not? What is that? I don't believe you described that? A Well, there are various types of attrition mills. The ones known in the trade, for example, are the Sprut-Waldron, manufactured by a company that produces a certain type of mill that is used for defiberizing chips, and there is the Bauer Brothers' Machine which is a comparable machine that does the same sort of thing.

[52] Q Do they have a characteristic structural feature in common? A The Sprout-Waldron and Bauer are comparable in construction. They have rotating discs that are serrated and they are held very closely together. You can separate them by two-thousandths of an inch or four-thousandths of an inch, and you add your pulp, your chips rather, at one part of the machine and as it passes through these discs they are disintegrated or defiberized to their relative components.

Q The extent to which the defiberization is carried out in a machine such as this would depend, would it not, on the distance between the serrated discs? A Yes, this can be governed by the distance of the serrated discs.

* * * * *

Dr. Arthur B. Anderson—Re-Direct.

RE-DIRECT EXAMINATION.

By Mr. Blenko:

Q Would the setting of the discs be adjusted so as to get a true defiberization? A This is true, sir, yes. In other words, the purpose of this machine is to take this aggregate, pulp aggregate or chipped aggregate and break it up and segregate it into its fibers, and this can be governed certainly by setting the serrated discs at the respective positions. As a matter of fact, it can be set so closely you come [53] out with wood flour.

Q You mentioned a Bauer mill. Is that the machine that is referred to on page 10 of the Lighthall-Anderson application? Look at the paragraph at the very top of the page. A "Carried out in defiberizers such as the Allis-Chalmers, the MacMillan, the Bauer or the Asplund."

Q Yes. A We have used several of these. As a matter of fact, at the plant at Dee, Oregon we used two of these types of defiberizers. We first passed the chips through the Asplund for the initial breakdown of the material and from there it goes to a Sprout-Waldron which is comparable to the Bauer.

Q The machine you mentioned in answer to Mr. Cochran's question was a Bauer machine? A Yes.

Q And that is the same machine that is referred to in the application, is that correct? A Yes, sir.

* * * * *

Dr. William T. Nearn—Direct.

DOCTOR WILLIAM T. NEARN was called to the stand as a witness by counsel for the plaintiff [54] and having been first duly sworn, was examined, and testified as follows:

DIRECT EXAMINATION.

By Mr. Blenko:

Q Are you Doctor William T. Nearn? A I am.

Q Where do you live? A I live at the State College, Pennsylvania.

Q What educational institute are you associated with? A The School of Forestry, Pennsylvania State University.

Q What is your academic rank there? A I am associate professor of wood utilization.

Q What has been your education and experience in the field of wood utilization? A I received a Bachelor of Science degree from the New York State College of Forestry in this field. I received a Master of Forestry degree from the School of Forestry, Yale University, and Doctor of Forestry degree from the same institution.

Q Have you had any foreign service for the government as a scientific consultant in this field? A During the occupation in Japan I acted as Scientific Consultant in the Natural Resources Section, General Headquarters, Tokyo.

Q Have you written any technical papers in the field of [55] wood utilization? A I have.

Q Doctor Nearn, I am going to hand you Plaintiff's Exhibit 8 and I will ask you whether you have, at my request, made a microscopic examination of any of the defiberated material contained therein.

* * * * *

Dr. William T. Nearn—Direct.

[56] *The Witness*: I recognized this material. It was given to me by Doctor Anderson and I did examine it microscopically.

By Mr. Blenko:

Q Did you make any photomicrographs for the purpose of developing so that the human eye might see just what that material consists of? A I did.

Q Will you please produce such a photomicrograph?

(A photomicrograph was marked as Plaintiff's Exhibit 9 for identification.)

By Mr. Blenko:

Q I have had the photomicrograph marked for identification, Doctor, as Plaintiff's Exhibit 9. I will hand it to you and ask you to state to the Court what it shows. I also have a red crayon here and if you want to use legends and lead lines so that the exhibit will tell us at a later date just what your evidence means, use it. A Shall I show it to you, sir.

* * * * *

I would point out on this photomicrograph that there is a particle of cork and that these other bodies around here are fibers. More specifically, they would be wood fibers. And I would add that the cork particle designated here is essentially free from the other constituents of the bark.

[57] *By Mr. Blenko*:

Q Will you please mark with a lead line and the word cork the material which you identified in the photomicrograph as a cork particle? Now, will you please correspondingly mark one or more of the fibrous

'constituents? A The lead lines aren't too good on there.

Q Now, Doctor Nearn, have you made any corresponding photograph of a cork particle derived from Douglas fir bark in its native condition? A I have.

Q Am I correct in my understanding that you obtained the material for photographing from the bark specimen which is now marked Plaintiff's Exhibit 3? A I did.

Q Will you please produce that photograph?

(A photomicrograph was marked Plaintiff's Exhibit 10 for identification.)

By Mr. Blenko:

Q I have had this second photograph marked Plaintiff's Exhibit 10 for identification and I will ask you to state for the record what it shows, and I will ask you to apply a legend identifying any cork particles that appear therein. A Plaintiff's Exhibit 10 shows two cork particles which I am indicating here and will so mark.

Q What sort of an operation did you perform in order to [58] obtain the cork particles of Plaintiff's Exhibit 10 from the bark specimen, Plaintiff's Exhibit 3? A I sawed off a piece of Plaintiff's Exhibit 3 and ground it up with a mortar and pestle and then I added some water to it to float the cork particles loose, and cleaned it up a little.

Q Do the cork particles shown in Plaintiff's Exhibit 10 have any adherent non-cork constituents? A To the best of my knowledge, no.

Q How do they compare in that regard with the cork particles of Exhibit 9? A I would say they were essentially the same.

Dr. William T. Nearn—Cross.

Q To what magnification were the micrographs made? A They are approximately 100X or 100 times the size.

Q Does that mean 100 times each dimension or 100 times the area? A I would say 100 times the area.

Q Did you in your ocular examination, prior to setting up the camera for the purpose of taking these pictures, observe any other cork particles either in the defiberated mass of Exhibit 9 or the ground up bark Exhibit 10? A In the defiberated material under a microscope you could see numerous cork particles. In regard to the second part of your question, I didn't understand how that applied there [59] because I broke down what I believe to be the cork and nothing else to make that picture.

Q Well, is the cork particle which is illustrated in Plaintiff's Exhibit 9 for identification fairly representative of the cork particles that you found distributed through the defiberized mass? A I would say it is.

* * * * *

(Plaintiff's Exhibits numbers 9 and 10 previously marked for identification were received in evidence.)

* * * * *

CROSS EXAMINATION

By Mr. Cochran:

Q Doctor Nearn, in preparing the sample which resulted in Plaintiff's Exhibit 10, you said you floated out the cork particles, did you not? A That is right.

Q Your testimony was that that was to clean it up a little? A Well, yes, I said that.

[60] Q What do you mean by that? A Well, amorphous powder is clinging in there, and the cork particles are easier to pick out if you float them.

Q Would it be correct to call this material that you arrived at in Exhibit 10 purified cork? A Yes.

* * * * *

[61] (The complete file record of proceedings in the Patent Office concerning Lighthall-Anderson application was received in evidence as Defendant's Exhibit No. 1.)

*Plaintiffs' Exhibit 1.***Plaintiffs' Exhibit 1, Specification And Drawing In
Lighthall-Anderson Patent Application****SPECIFICATION****COMPOSITION BOARDS CONTAINING
DOUGLAS FIR BARK**

TO ALL WHOM IT MAY CONCERN:

Be it known that ALBERT C. LIGHTHALL, deceased, and ARTHUR B. ANDERSON, a resident of El Cerrito, Contra Costa County, California, have made new and useful inventions in COMPOSITION BOARDS CONTAINING DOUGLAS FIR BARK, of which the following is a specification.

This invention relates to water resistant, strong, composition boards and like products containing lignocellulose in particle form together with comminuted or defiberized Douglas fir bark as a unique additive component.

Composition boards and other consolidated fibrous products conventionally are made by reducing lignocellulose to fiber or particle form, forming a felt or mat of the resulting finely divided material by wet, moist or dry felting procedures, and heating the resulting mat with or without the application of substantial pressure. When substantial pressure is not applied during the heating operation, the product is porous and of low density and finds its principal application as insulating board. Where, however, substantial pressure is applied during the heating operation, the particles of lignocellulose material are consolidated to form a board of relatively high density, e.g. a density of from 0.8 to 1.25,

Plaintiffs' Exhibit 1.

which is used extensively as hardboard, panel board, flooring and the like.

The water resistance and strength of such fibrous composition boards obviously are of primary importance in determining their suitability for use in the customary applications. If the boards tend to absorb moisture, they will swell and warp when used in moist environments. It therefore is conventional practice to incorporate in the fibrous mixtures from which the boards are made, materials which have the effect of preventing the absorption of water into the fibers. A variety of such materials commonly are employed, representative ones being drying oils, resinous binders, and paper makers' sizing materials such as resin, sodium resinate, wax, starch, dextrin, various gums, albumin, casein, and the like.

The foregoing sizing materials customarily are mixed with the fiber before it is formed into boards. Substantial amounts usually are employed, i.e. amounts of more than 3% by weight, in order effectively to coat the fibers and prevent the absorption of moisture into the same by capillary attraction. When a wet felting procedure is employed, a common method of incorporating the size comprises adding it to the aqueous pulp suspension in the pulp chest just ahead of the head box of the wet forming machine. To facilitate its thorough dispersion throughout the pulp, it usually is added, in the form of sodium rosinate, if a rosin size is employed, or as an aqueous alkaline wax dispersion if a wax size is used.

After the addition of the sizing agent, the mixture is agitated thoroughly, after which alum or mineral acid

Plaintiffs' Exhibit 1.

is added in amount sufficient to adjust the pH of the pulp mixture to a level of pH 4 to pH 5.5. This converts the sodium rosinate to insoluble rosin in the one case, and destroys the water miscible wax emulsion in the other case so that the sizing agent is deposited on the fibrous material. Obviously the sizing operation adds appreciably to the cost of manufacture of the boards, because of the added cost of the necessary materials, labor and equipment.

Although other workers in the field have proposed the use of tree bark in composition boards, none of them up to the present time has developed a commercially acceptable procedure for making such products from furnishes containing a substantial proportion of bark. To the contrary, it has been the belief of composition board manufacturers that the presence of bark deleteriously affects the strength and other properties of the boards to such a degree as to render them commercially unacceptable.

Thus Ellis, U.S. 2,030,626 indicates in a general way the use of bark in consolidated fibrous products, but does not point out the conditions which must be employed if bark is included, nor any particular bark species as being unique in its action. Similarly, the use of bark in hardboard is suggested in Report on the Third International Conference on Timber Utilization at Paris, pages 90-97, July 1937. In this report, however, the effectiveness of bark is indicated to be controversial and no conditions or bark species are indicated to be critical to the successful application of this material in hardboard manufacture.

Still further, Clermont et al., Paper Trade Journal, pages 57-59, May 6, 1948, disclose a hardboard made from

Plaintiffs' Exhibit 1.

cedar bark. The product, however, is deficient in strength and water resistance, and again no critical conditions of operation or unique bark species are disclosed. Still further, Schwartz et al., Paper Trade Journal, pages 36-7, February 20, 1947, and page 37, October 2, 1947, disclose a hardboard made from Western hemlock, white fir, and Douglas fir slabs and edgings. Although these investigators employed raw material which heretofore has been considered a waste product largely because of its high bark content, it is significant to note that the slabs and edgings were debarked prior to reducing the wood and forming it into hardboard. This again is a significant indication that commercial operators have considered the presence of bark to be undesirable in hardboard making compositions.

Accordingly, the use of bark has been avoided scrupulously even though this has necessitated debarking the wood used as a raw material. Various methods of debarking have been employed, as mechanically in machines of varying design, hydraulically, and even manually. This operation obviously adds substantially to the cost of making the product. It also results in the production of large quantities of a substantially valueless product, i.e. waste bark.

It is the essence of the present invention that, surprisingly and contrary to the teaching of the prior art, the bark of the Douglas fir when incorporated in fibrous composition boards not only is not detrimental, but actually enhances the value of the boards by increasing their water resistance to acceptable limits without seriously reducing their strength or otherwise adversely affecting their properties. Thus, the inclusion of 35%

Plaintiffs' Exhibit 1.

by weight of the bark of this species in a Douglas fir hardboard, without the inclusion of any added size or binder whatsoever, produces a product having a water absorption of only 6.7 and a rupture modulus of 8,085 pounds per square inch.

In order to obtain these desirable results, however, it is essential that two conditions be fulfilled. First, the bark must be in comminuted or defiberized form for distribution throughout the mixture so that its beneficial action is exerted uniformly therethrough. Secondly, if added size material is employed to increase the water resistance of the product even further, its use must be kept below a critical limit of 3% by weight. If 3% or more of size is employed, it disastrously affects the strength of the product. It is this factor which no doubt explains the persistent belief prevalent among fiberboard manufacturers in the past that the presence of bark in such products is harmful. In an attempt to control the water resistance of the product, 3% or more of size has been used. As a consequence the strength of the product has been lowered to a point at which it no longer would meet commercial standards.

Another reason for maintaining the size usage below 3% in the presently described product is that in the lower ranges of size use there is a marked synergistic sizing action between the size and the bark, at least with certain specimens of Douglas fir bark. In other words, when Douglas fir bark and size in limited amount are employed together in making composition boards of the type described herein, the water resistance is increased to an unexpectedly high degree over that obtained when the size and bark are used individually,

Plaintiffs' Exhibit 1.

demonstrating a synergistic effect as opposed to one which is merely cumulative.

Thus, broadly and simply stated, the presently described novel composite products comprise lignocellulose in particle or defiberized form mixed with the bark of the Douglas fir in comminuted or defiberized form, the resulting mixture having been consolidated to the desired density. Such products are characterized by several desirable properties of the greatest commercial significance. In the first place, they have a high degree of water resistance even though they contain no added or extraneous sizing material. In the second place, their strength is maintained at a level which is far above the minimum commercial strength requirements, even though they contain no extraneous binder. Third, they may be made from waste wood such as Douglas fir slabs and edgings which now may be routed to the board-making plant rather than to the waste burner.

Fourth, bark is defiberized more easily than is wood. As a result, the power consumption for making the presently described bark-containing product is lower by about one-third than it would be if the products were made from wood alone.

Fifth, if a wet-felting process is employed, consistencies of from 4 to 6% may be employed when bark is used as a constituent of the felting mixture. This contrasts with consistencies of 1 to 2% when bark is absent.

Sixth, the bark appears to serve a lubricating function in the pressing operation so that a smaller amount of caul lubricant may be employed.

Plaintiffs' Exhibit 1.

Finally, all of the foregoing factors contribute to the production of a product which is very low in cost. This result stems, of course, from the fact that no extraneous size or binder need be used, the cost of the phenolic binders customarily employed being one of the principal items of cost in conventional hardboard manufacture. Also, the expense of the equipment and labor necessary for executing an extra processing step, i.e., addition and mixing in of the added size or binder, is eliminated. Further, a substantially valueless raw material, i.e., Douglas fir slab wood and edgings may be used as the raw material for making the product. Still further, as noted above, additional savings are obtained because of the low power consumption required, the use of high consistencies in wet felting and improved lubrication of the press caul plates. These important economies are achieved, furthermore, while producing a product characterized by very high water resistance and strength, which is more than competitive with commercial products of the same class now being marketed.

The lignocellulose material which is used together with Douglas fir bark in making the presently described composition board products may be derived from various sources. Thus it may comprise cane or straw, but usually the wood of various species of trees.

The bark employed is derived from the Douglas fir (*Pseudotsuga taxifolia*). As is well known, the wood of this tree is a major source of lumber and as a result large amounts of slab wood and edgings having a substantial proportion of bark thereon are obtainable from commercial operations.

The amount of this bark employed together with the lignocellulose is somewhat variable depending upon

Plaintiffs' Exhibit 1.

the properties desired in the product. Up to a certain bark content the degree of water repellence imparted to the product is proportional to the amount of bark used. Thus even small amounts, i.e. amounts of as little as 5 to 10% by weight of bark may be used with some effect although to obtain maximum advantage from the use of this constituent it should be incorporated in amounts of from 20 to 50% by weight, based upon the dry weight of the final product. As will be demonstrated later, however, amounts of even more than 50% may be used, the properties of hardboard made from 100% Douglas fir bark being within commercial specifications. Since unbarked Douglas fir slabwood and edgings contain on the average of about 35% by weight bark, these waste products are ideally suited as sources of both bark and woody constituents of the presently described product.

Where it is desired to augment the water repelling effect of the bark, supplementary amounts of wax, rosin, or other papermakers' sizing materials may be used together with the bark. As noted above, however, if more than a critical upper limit of sizing material is employed, its desirable synergizing effect in greatly enhancing the water absorption characteristics of the boards is offset by a drastic reduction in board strength. For this reason, sizing materials are not to be used with the bark in amounts greater than up to 3% by weight based on the dry weight of the final product. Preferred amounts which produce high water resistance while maintaining a high level of board strength are from 0.5 to 2.0% by weight.

Also, other materials such as fire-proofing agents, insecticidal materials, and auxiliary binders such as from 0.1 to 5.0% by weight of the thermosetting phenol-

Plaintiffs' Exhibit 1.

aldehyde resins, particularly the phenol-formaldehyde resins, may be incorporated as necessary or desirable.

In making the presently described bark-containing consolidated products, the bark and wood or other lignocellulose material first are reduced to fiber or equivalent finely divided form. This is desirable in order to secure an intimate mixture of the bark and lignocellulose material particles to take full advantage of the water repellent characteristics of the bark, and to form a consolidated product presenting a substantially uniform exterior surface. Where a mixture of particles of lignocellulose material and bark particles of heterogeneous sizes is employed, the surface of the resulting consolidated product is non-uniform since in any given area there will be a mixture of large and small pieces of wood and bark. These substances have different moisture absorption and swelling characteristics. As a result, when the product is subjected to a moist environment, it swells non-uniformly, producing an uneven surface which is undesirable in many applications. Furthermore, the presence of large pieces in the product affects its strength adversely.

The reduction of the lignocellulose and bark may be effectuated in any suitable type of apparatus. Preferably, it is carried out in defiberizers such as the Allis-Chalmers, the MacMillan, the Bauer, or the Asplund. These have for their function the separation of the lignocellulose fibers from each other while preserving them unbroken transversely in varying degree.

Before defibration, the wood may be subjected advantageously to a preliminary steaming operation in order to soften it. Thus in one mode of operation Doug-

Plaintiffs' Exhibit 1.

las fir slabwood first is reduced to chip form. The chips then are subjected to a preliminary steaming operation as by subjecting them to an environment of steam under pressures of from 50 to 150 pounds per square inch and corresponding temperatures for saturated steam for times of between 10 and 30 minutes. Under these conditions, the wood is softened without excessive degradation.

The steamed chips then may be defibrated in a Bauer refiner which serves the further important function of mixing the defiberized bark uniformly throughout the mixture. If extraneous size and binder are added, these also may be mixed in at this stage or in subsequent stages of operation.

The defiberized mixture then is formed into a felt or mat by any conventional wet, moist or dry-felting technique. If dry felted, the felt may be consolidated by being pressed for example at from 200 to 1000 psi and from 100 to 300° C. for from 10 to 30 minutes, where a $\frac{3}{8}$ inch hardboard product having a density of about 1 is desired.

If, on the other hand, the mat has been wet-felted and an insulation board is desired, the wet felt may be dried in a drying room, oven or similar equipment. If the wet felt is to be formed into a hardboard, the felt may be dried and consolidated between the platens of a hot press under the general conditions of time and pressure indicated above, preferably at from 200 to 400 psi and 150 to 250° C. for 15 to 25 minutes. If size is to be added in the wet process, sodium rosinate, an aqueous alkaline wax emulsion or other sizing material may be

Plaintiffs' Exhibit 1.

added to the pulp, followed by agitation and acidification to a pH of 4 to 5.5 in the manner explained above.

The composition boards of the invention and their water repelling and strength qualities are illustrated in the following examples wherein the amounts of the constituents are expressed in percent by weight. In examples 1-13, the boards were made by reducing the wood and bark to chip form. The chips then were steamed for 30 minutes at 100 pounds steam pressure and corresponding temperatures for saturated steam. The steamed material then was defiberized between serrated metal discs in conventional manner. No binder was employed and size (if used) was added to the resulting pulp mixture, after which the mixture was wet formed on a screen and the wet sheet pressed at 250 psi and 190° C. for 20 minutes.

The $\frac{1}{4}$ inch hardboard resulting from the foregoing procedure had a density of about 1 and was of a uniform brown color. The strength and water repelling qualities of each board were measured by standard test methods. The moisture absorption and thickness swelling were determined by soaking weighed samples in water at 70° F. for twenty-four hours and determining the increase in weight and increase in thickness at the end of this period. The moisture absorption then was expressed as percent by weight of the original weight of the same, and the thickness swelling as percent increase of the original thickness. The strength characteristics were determined by subjecting the samples to the conventional test method for measuring the flexural strength (modulus of rupture on flexing) this being expressed in pounds per square inch.

Plaintiffs' Exhibit 1.

The examples of Table I illustrate the effect of the use of Douglas fir bark on the properties of consolidated fibrous boards made by the above procedure.

Table I.

Ex. No.	Douglas Fir Bark %	Water Absorption %	Thickness Swelling %	Modulus of Rupture psi
1	0	52.0	32.3	4400
2	20	26.0	14.9	4070
3	25	18.6	9.5	4312
4	30	10.4	6.8	4110
5	40	8.9	6.1	4080

The effect of a sizing agent used together with the bark is shown in the examples of Table II.

Table II.

Ex. No.	Douglas Fir Bark %	Rosin Size %	Water Absorption %	Thickness Swelling %	Modulus of Rupture psi
1	0	...	52.0	32.3	4400 (Control)
6	0	1	26.0	16.4	4300
7	0	3.0	10.3	10.0	...
8	20	1	9.0	6.7	4096
9	25	1	7.9	5.9	4100
10	30	1	6.8	5.6	3930
11	32	1.5	4.7	4.7	4110
12	32	3.0	5.1	5.8	3100

The following example illustrates an insulation board of the invention and the method of its preparation.

Example 13

A 1/2 inch wet mat (40% solids by weight) consisting of 74% wood fiber and 25% Douglas fir bark fiber with 1% rosin size was dried in a conventional insulating board drier. The resulting product had a board weight

Plaintiffs' Exhibit 1.

of 772 pounds per 1,000 square feet and a modulus of rupture of 422 psi.

In a manner similar to the foregoing, composition board may be prepared employing in place of the paper makers' rosin size other sizing materials including wax, starch, dextrin, gums, gelatin, albumin, casein, and the like.

The following examples illustrate the results obtainable by incorporating bark in hardboard using improved techniques of defiberizing, felting and pressing. The operating procedure was as follows:

The bark was separated from the wood and hammermilled for preliminary size reduction while the wood was chipped. Bark-wood mixtures then were formed in various compositions. Each mixture was defibrated in an Asplund defibrator, being presteamed for 5 minutes with a final pressure of 90 psig. The steamed mixture then was admitted to the defibrator chamber where it was held for 1 minute. The product was passed into a cyclone for separation of the coarse fibers.

The defiberized mixture then was pulped in a Bauer disc mill to form a pulp having a consistency of from 4 to 6%. If the board were to be sized, rosin size was added to the pulp and stirred for 10 minutes after which an equivalent quantity of paper makers' alum was added with stirring for an additional 10 minutes. The pulp mixture was formed readily into a wet lap under a vacuum of 5 inches or less. The mat was pressed in a hot-press at 500-50-500 psi for 2-3-15 minutes. The resulting boards were about $\frac{1}{4}$ inch thick and had a specific gravity of about 1.

Plaintiffs' Exhibit 1.

The water absorption and modulus of rupture of these boards then were determined by standard test methods with the results given in Table III.

Table III.

Ex. No.	Bark Species	Bark %	Size %	Water Absorption %	Rupture Modulus psi
14	None	0	0	65.4	6623
15	"	0	1	11.2	4920
16	"	0	2	10.2	4617
17	"	0	3		4300
18	Douglas fir	15	0	14.8	5650
19	"	25	0	9.3	5175
20	"	35	0	6.7	6085
21	"	45	0	7.5	5060
22	"	100	0	7.7	3880
23	"	15	0.5	8.1	5135
24	"	25	0.5	7.6	5160
25	"	35	0.5	5.7	4935
26	"	45	0.5	8.4	5130
27	"	0	1.0	11.2	4920
28	"	35	1.0	5.7	4570
29	"	0	2.0	10.2	4617
30	"	35	2.0	5.4	3965
31	"	0	3.0	8.3	4300
32	"	35	3.0	5.1	2880
33	Noble fir	20	0	85.0	3600
34	"	40	0	75.9	3000
35	White fir	35	0	65.0	5185
36	Southern pine	20	0	81.0	3200
37	"	30	0	80.1	3300
38	Mexican pine	15	0	55.5	5970
39 (Pino Lacis)		35	0	48.0	4460
40	Western Hemlock	35	0	56.2	5030

Plaintiffs' Exhibit 1.

From a consideration of the foregoing results, several significant conclusions are evident. First, whereas a hardboard made from 100% Douglas fir wood (Example 14) has a water absorption of 65.4, one made from 65% Douglas fir wood and 35% Douglas fir bark, with no added size or binder whatsoever, (Example 20) has a water absorption of only 6.7%, the strength of the board being reduced very little over that of the board containing no bark.

Secondly, the unique character of Douglas fir bark is evident. Compare Examples 18-22 for Douglas fir bark with Examples 33-40 for boards containing noble fir, white fir, southern pine, mexican pine and western hemlock. It is strikingly apparent from these values that the sizing qualities of Douglas fir are markedly superior to any which may characterize the barks of the latter species.

Still further, the effect of increased size usage is apparent. Compare examples 14-17, 20, 28, 30 and 32. The results of these examples are plotted in the single figure of the drawing, which illustrates the effect on rupture modulus of increased size usage first on a hardboard containing 35% Douglas fir bark and 65% wood, and second, on a 100% wood hardboard. It is evident from this graph that adding as much as 3% size to the bark-containing hardboard disastrously affects the strength of the product. In fact, a 3% size content decreases the board strength to a point where it does not meet commercial standards.

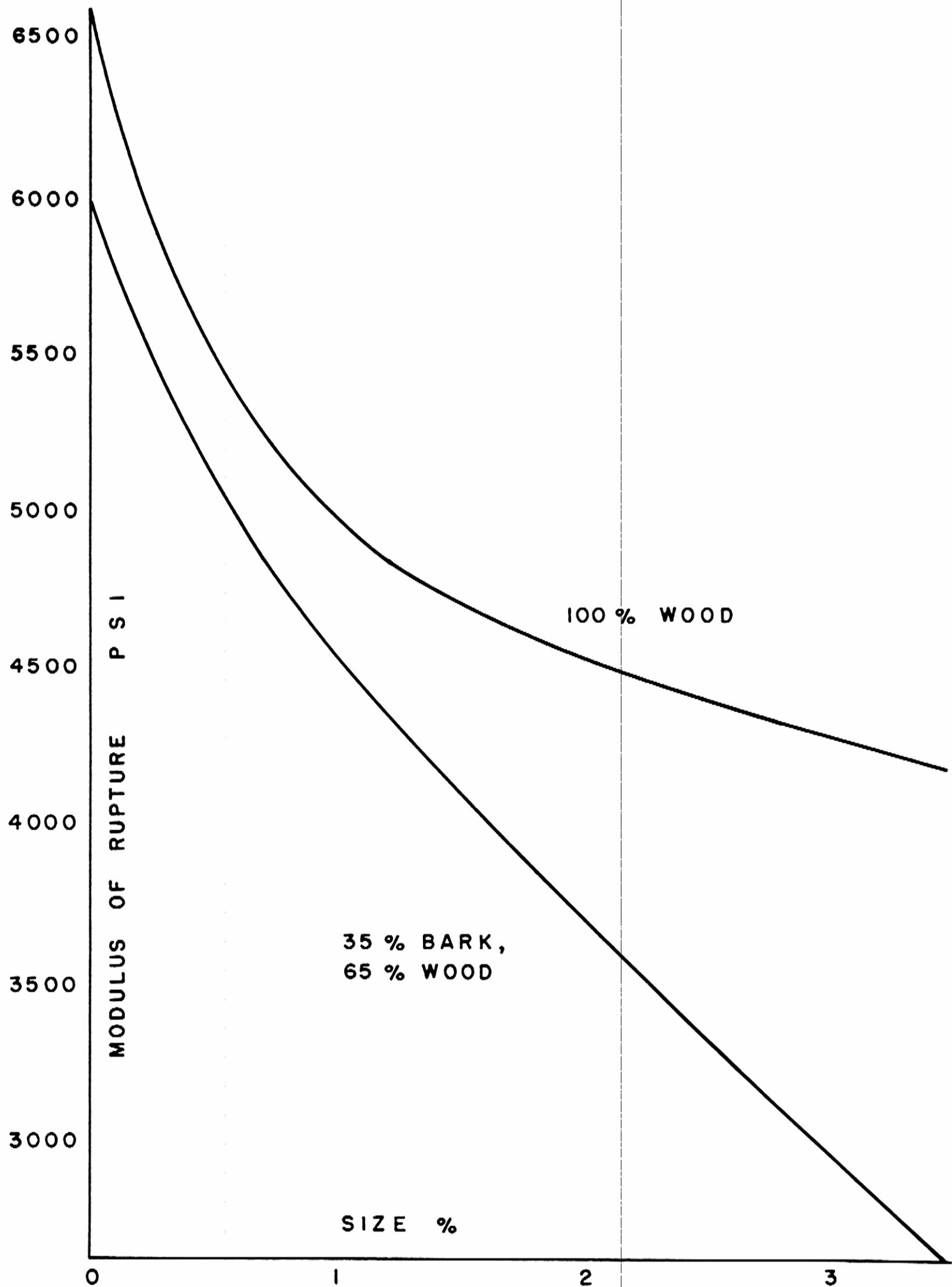
This effect is not so evident with a 100% wood board. It will be noted from the corresponding curve that using 3% size with such a board, although it decreases the

Plaintiffs' Exhibit 1.

strength to a certain extent, still leaves a board which has commercially acceptable strength qualities. As has been emphasized above, it is believed that it is this experience with sizing bark hardboards, using amounts of size at least 3%, that has been responsible for the conclusion that bark could not be incorporated successfully in commercial hardboards.

Thus, it will be apparent that by the present invention we have produced a superior composition board product of high water resistance and strength even though it contains no added size or binder. The product is made from a waste material, i.e. tree bark, which heretofore has had only minimum commercial value as fuel. These desirable results are obtained, furthermore, while producing a product which is very low in cost because of the elimination of the necessity of using costly added size and binder, the ability to use a low cost waste material, and the reduced cost of defiberizing the raw materials, forming them into a mat, and pressing the mat to form the finished consolidated product.

While certain preferred embodiments of the invention are described above, it is to be understood that the invention is not so limited and that it may be otherwise variously practiced within the scope of the following claims.



INVENTOR.
ALBERT C. LIGHTHALL AND
ARTHUR B. ANDERSON
BY

Eugene D. Farley
ATTY.

BEST COPY

from the original

1

24,174

CORK-BOUND HOT-PRESSED BOARDS

Clark C. Heritage, Tacoma, Wash., assignor to Weyerhaeuser Timber Company, Tacoma, Wash., a corporation of Washington

No Drawing. Original No. 2,736,063, dated February 28, 1956, Serial No. 232,863, June 21, 1951. Application for reissue April 19, 1956, Serial No. 582,513

19 Claims. (Cl. 18—47.5)

This invention relates to hot pressed structures, usually boards, made from wood particles bonded together with the thermoplastic constituents, and particularly the cork tissue component, of the barks of coniferous trees.

It is an object of the present invention to provide hot pressed structures employing wood particles and comminuted bark as the principal constituents, the thermoplastic components of the bark functioning as a binder material. A further object is to provide a method for making hot pressed structures from a mixture of wood particles of varying size and shape, and from comminuted bark containing an appreciable amount of cork. Incidental objects are to provide both the operable and optimum percentage compositions of the materials for different purpose boards; both operable range and optimum pressing conditions of pressure, temperature, and time; both the operable and optimum ranges for moisture content for the wood particles, cork particles, and the felted mat preliminarily to hot pressing; and to provide means, either as additive materials or by novel treating methods, for producing a board having a water absorption capacity of a quality acceptable for industrial and commercial uses. Other objects and advantages of the invention will appear from the following detailed description.

The invention contemplates broadly the discovery that the cork and parenchyma tissue components of the bark of coniferous trees may be utilized as thermoplastic binding materials for binding together fibers or other wood particles conventionally used in the making of hot pressed structures, such as boards, molded articles, and the like. Such hot pressed structures are referred to herein generically as boards. The principal application of the invention is in the making of the various types of artificial boards made from wood particles or wood fibers and commonly denominated structural hardboards, core boards, panel boards, moldable boards, molded boards, insulation boards, etc.

The bark from which thermoplastic binding materials are derived may be obtained from many species of trees. Particularly suitable are the barks of coniferous trees used commercially as sources of lumber and wood products, since the barks of such trees are obtainable in large quantities at low cost.

The bark of coniferous trees is composed primarily of three different tissue components, to-wit: cork, sclerenchyma tissue in the form of either bast fibers or stone cells, and parenchyma tissue made up chiefly of sieve tubes but containing also food storage cells, companion cells, and connecting ray tissues. Each of these three tissue components differs widely from each other, both in appearance and in their physical properties. The cork and parenchyma tissue fractions are thermoplastic, whereas the sclerenchyma tissue fraction is not. However, the cork component provides better flow characteristics than the parenchyma tissue component; produces boards of lower density than the parenchyma tissue and thereby enables the attainment of higher strength-density ratios than can be obtained with parenchyma tissue; and, accordingly,

2

is the bark tissue component preferred as the binder material in the present invention.

The bark may be fractionated into its separate components by methods which rely upon the selective comminution of the bark constituents followed by the application of mechanical methods for separating the products of various particle size. Such methods are represented by those disclosed in the patent to Anway for Method of Treating Bark, No. 2,437,672, issued March 16, 1948, in the patent to Pauley for Production of Pure Bark Fiber, No. 2,446,551, issued August 10, 1948, and in the copending application of Bror L. Grondal and Calvin L. Dickinson, for Method of Treating Bark, Serial No. 572, filed January 5, 1948, now Patent No. 2,627,375, issued February 3, 1953, said application having a common assignee with this application. The whole bark is subjected to one or more comminuting operations at a controlled moisture content, whereby the non-fibrous phloem is reduced to a powder, the fiber bundles are opened up to release the individual fibers, but the relatively resistant aggregates of cork cells comprising the cork layers are not substantially reduced in size. There are thus produced three fractions having different particle sizes, i. e., powdered phloem or parenchyma tissue, ultimate fibers or stone cells (sclerenchyma tissue), and natural cork.

The cork component of bark flows with ease when subjected to heat and pressure. It imparts a high degree of flow to compositions in which it is contained, and contributes strength properties corresponding to those contributed by thermosetting resins. Cork in the form of flakes or granules compressed in a mold at 3000 pounds per square inch and 300° F. for a time period of seven minutes flows readily throughout the mold to form a board having a smooth, glossy surface. The color of the board is uniform and individual particles of the cork are not distinguishable. The foregoing properties are only partially obtained from the parenchyma tissue and are substantially lacking in the sclerenchyma tissue. For example, the fiber of bark flows with difficulty when subjected to heat and pressure. The surfaces of articles made, for example, by compressing the fibers of Douglas fir bark in a mold at 300° F. under pressure of 3000 pounds per square inch for about 7 minutes, are uneven and rough. The individual fibers do not readily blend together to form a molded article having a smooth, glossy and uniform surface, and the fibers are distinguishable at the surface and may be rubbed therefrom by frictional contact. A bark fraction consisting substantially of parenchyma tissue in powder form, heated and pressed under the conditions described above, forms a board having a smooth, hard surface of uniform dark color. The surface is dry and has a higher gloss than does the surface of the cork board. Parenchyma tissue, therefore, contributes some of the properties of both cork and fiber, and, in addition, is useful for contributing to the appearance of the finished article.

Whole barks containing an appreciable amount of cork are of practical utility in the practice of the invention, it being necessary, however, that the cork content of the bark constitute not substantially less than 5% of the total mixture of bark and wood particles. The other constituents of the bark contribute their respective properties to the completed board, the sclerenchyma tissue, in the case of the barks of Douglas fir, Western red cedar and redwood, adding to the fiber content of the mixture.

The cork component obtained from coniferous trees is not to be confused with the cork of the Mediterranean cork oak. Mediterranean cork oak bark is not thermoplastic. It is true that Mediterranean cork oak bark is sometimes bound under pressure and heat, but such binding comes about as a result of the cementing action of a resin surrounding the cork cells. The individual cork

particles remain discrete, even when bonded together by the inter-cellular resin content of Mediterranean cork. This is quite contrary to the action of the cork from coniferous trees, inasmuch as such cork flows upon the application of heat and pressure of the order of 400 pounds per square inch at 400° F., and congeals upon cooling to an amorphous, homogenous solid.

Cork derived from the bark of coniferous trees differs further from that of the Mediterranean cork oak in that it demonstrates its thermoplastic properties at temperatures which are far below those necessary to soften the resinous content of the cork oak bark.

Still further differences between the cork of coniferous trees and Mediterranean cork with respect to their physical and chemical properties are pointed out in the application of Robert D. Pauley, Serial No. 36,409, filed July 1, 1948, for Bark Components as Resin Ingredients.

The fibrous material employed in the preparation of the boards of the present invention may be derived from usual sources. Among these are, for example, cotton, flax, cornstalks, bagasse, wood fiber, and many others. Particularly suitable are the fibers obtained from the woods of such trees as are utilized in the production of lumber and paper pulp, representative woods being aspen, jack pine, Douglas fir, white fir, and Western red cedar. Wood fibers prepared by either the Asplund defibrator or the McMillan machine are particularly useful in the manufacture of hardboards. Asplund defibrator fiber is prepared by the process and machine disclosed in Asplund Patents Nos. 2,008,892 and 2,145,851; and McMillan fiber is disclosed in McMillan Patent No. 1,913,607. It is to be understood that the employment of wood fibers or wood particles from the species named above in the preparation of the hardboards exemplified hereinafter is merely illustrative and is not intended as limiting the scope of the present invention.

Having thus generally described the nature and source of the principal ingredients of the boards of the present invention, the invention will now be described with reference to the details of composition and processing employed.

STRUCTURAL HARDBOARDS

The primary requirements of hardboards representing the highest quality of artificial lumber for structural purposes are that they have a high ratio of structural strength to density, high water resistance, good workability (i. e., amenability to sawing, nailing, and so forth); and, in many instances, a pleasing appearance is a requisite. Structural hardboards are usually either 1/8 or 1/4 inch in thickness.

It has been found that a variation in fiber size is desirable to provide a pleasing, non-repetitive surface pattern. A preferred fiber size is that having a four screen coarseness modulus of about 200, as determined by the method disclosed in U. S. Patent No. 2,325,055, issued July 27, 1943, to C. C. Heritage. However, it is to be understood that hardboards can satisfactorily be made from a wide range of both fiber and wood particle sizes. The size mentioned above is preferred for the reason that optimum physical properties of the boards are obtained when fiber sizes in this vicinity are used.

The cork used as a binder for the hardboard is obtained from the barks of coniferous trees in a manner hereinbefore described. It has been found that the structural strength, water resistance, and workability increases as the particle size decreases. Cork particles of a size which will pass through an 80 mesh screen provide the requisite high degree of structural strength and, at the same time, make the practice of the invention practical from a safety and economic standpoint.

Proportions.—The cork and wood particles may be used in a wide range of percentage ratios. However, the range of percentage ratios is fairly narrow with reference to the optimum quality for any specific condition of processing or for a particular purpose board. The fol-

lowing observations may be noted: Other conditions remaining constant, the water absorption decreases progressively at a diminishing rate of decrease as the ratio of cork to wood increases. The greatest rate of improvement in water resistance is made by the addition of increments of cork in the range from 0% to 10%. See Table I, below:

Table I

Pressing temperature.....	300° F.
Pressure.....	To stops set for 1/8" thickness.
Time of pressing.....	15 min.
Density of board (adjusted).....	60 lb./ft. ³

Percent Cork (Abies concolor)	Percent Wood (Abies concolor McMillan fiber)	Percent Moisture Content Mat., o. d. basis	Percent Water Absorp- tion	Cond. Den- sity	Modulus of Rupture #/in. ²
0.....	100	21	150	52	2,250
5.....	95	23	80	59.5	3,000
10.....	90	24	65	60.8	4,200
15.....	85	27	61	57.5	4,800
20.....	80	28	53	48.3	4,800
25.....	75	27.5	50	55.5	5,300
40.....	60	30	42	55.5	4,500

Optimum strength characteristics are obtained with decreasing proportions of cork as the temperature of pressing is raised within practical operating temperature limits of from 300° to 430° F. Stated another way, optimum cork usage decreases as the temperature of pressing is increased. The optimum modulus of rupture values attained over a range of from 0% to 40% cork usage where pressing was conducted to stops set for a board of 1/8" thickness, and the pressing temperatures and times were as shown in Table II, below.

Table II

Pressing Tem- perature	Press Dura- tion, minutes	Percent Cork (Abies con- color)	Percent Wood (Abies con- color McMillan fiber)	Opti- Modu- lus of Rup- ture, ¹ p. s. i.	Water Absorp- tion, ¹ percent
300° F.....	15	25-30	75-70	5,100	48
400° F.....	8	5-10	95-90	6,300	21

¹ Values shown corrected to board densities of 60 lbs./ft.³.

It will also be noted that lower water absorption values were obtained at 400° F. than at 300° F., which shows that temperature of pressing is an important factor in determining water resistance, since, as noted in Table I, above, other conditions remaining constant, increased cork usage promotes increased water resistance.

Cork usage has been correlated with pressure. It has been found that pressures of approximately 400 pounds per square inch are required to produce boards of 60 lbs./ft.³ density using proportions of 5-10% cork and 95-90% wood fibers, whereas pressures of from 310-340 pounds per square inch are adequate to produce boards of 60 lbs./ft.³ density from cork usages of 25-30% and wood fibers 75-70%. Yet another correlation was established for cork usage with respect to workability of the finished board. Boards containing smaller proportions of cork, such as 5-10%, were found to leave fuzzy or frayed edges when sawed. Boards containing 40% cork chipped at the edges when sawed and were more brittle than those in the range of from 15% to 25% cork content. Nailability of boards improved as the cork content was increased from 0% to 25%. It is concluded, therefore, that an optimum cork content for the production of all-purpose, high quality structural boards of the 60 lbs./ft.³ density class is in the range of 15-25%.

The preferred process for the making of the boards of the present invention is of a type known as dry felting. The wood fiber and cork particles are mixed intimately and distributed uniformly and evenly over the surface of a screen in a felting operation calculated to provide a

5

board when hot pressed of predetermined thickness and density. Means are preferably provided to prepress the unheated mat as formed to a considerably reduced thickness in order to reduce its bulk for convenience in subsequent handling steps. When the mat is formed on a moving screen, the pre-pressing is conveniently accomplished by suitably tensioned rollers disposed transversely of the moving screen and adjacent the felting area.

The mat is removed from the forming screen and placed on either a screen or a smooth caul and pressed under conditions of pressure, temperature, and time, which are discussed hereinafter.

Another factor found to be important from both the composition and processing standpoint is the moisture content of the fiber and cork before mixing and felting, and the moisture content of the mat after felting. All references herein to moisture content are to moisture content on an oven dry basis; i. e., the moisture content reported is a percentage based on the oven dry weight of the substance.

For example, a moisture content of 25% o. d. b. is equal to 20% moisture on a total or wet basis of the substance. It has been found that the moisture content of the cork for best results should be in a range of from 5% to 20%, and that the best strength characteristics for the pressed board are obtained using cork at the lower percentages of moisture content.

The moisture present in the fiber has been found to function as a plasticizer during the hot pressing treatment. It has been found, further, that as the moisture content of the fiber is raised from 20% to, say, 50% the water resistance characteristics of the board increase, but the structural strength properties decrease. Accordingly the moisture content of the fiber prior to felting was fixed at a range of between 20% and 50%. Mixing of the cork and fiber particles, and felting, is facilitated at higher moisture contents of the fibers. The cork particles seem to adhere to the fibers better at the higher moisture content and thereby to provide a greater degree of intimate dispersion. Accordingly, the process was devised of mixing the cork and fiber, with the cork at a moisture content of from 5-20% and with the fiber at a moisture content of from 20-50%, and after the felted mat has been formed the moisture content of the mat is reduced to 20-25% before pressing. In this manner, the advantages of the higher moisture content for the fiber during mixing and the advantages of better strength characteristics provided by the lower moisture content of the mat before pressing were both obtained. A convenient method for adjusting the moisture content of the felted mat is to draw air through the same.

In a study made to determine the effect of moisture content on fiber, cork, and mat, using 25% concolor cork, 75% concolor fiber, and pressing at 400° F., 400 pounds per square inch, for 8 minutes, it was concluded that the optimum moisture content for the fiber was 30-50%, cork 5%, and mat 20-25%. Boards pressed under these optimum conditions and a standard quality of Masonite Presdwood had modulus of rupture and water absorption values, corrected to 60 lb./ft.³ density, as follows:

	Modulus of Rupture	Water Absorption
Wood fiber and cork.....	6,200	16-19
Masonite.....	6,000	18

As high a moisture content as practicable is desirable for the cork because finely divided cork is hazardous from a fire and explosion standpoint. An optimum of 10-20% was selected on the basis that cork with moisture content lower than 10% was dusty and cork with moisture content of 25% had a tendency to agglomerate. Adherence of cork to fiber during mixing improved as the fiber moisture content increased. It was found desirable

6

to use the fiber at 20-50% moisture content for mixing the cork, and to dry the felted mat to 20-30% moisture content before hot pressing.

Temperature of pressing.—The cork flows more readily at higher press temperatures, and strength characteristics and water resistance of the board are improved in proportion to increase in temperature up to a safe margin under the temperature of decomposition. Press temperature was found to be correlated with press duration, using a ratio of 25% cork 75% wood fiber and with the pressing being down to stops so as to produce a board of 1/8" thickness, in the following manner:

Table III

Temperature, ° F.	Minimum press time to produce satisfactory board, minutes	Modulus of Rupture, p. s. i.	Water Absorption, percent in 24 hr.
280.....	25	4,700	54
300.....	15	5,300	50
330.....	8	5,400	48
375.....	8	5,900	53
400.....	3-8	5,800	41

¹ Values corrected to 60 lb./ft.³ density.

For each duration of pressing, all values improved as the temperature was increased, except at 25 minutes duration, increase of temperature from 375° to 400° F. showed a decrease in flexural strength, thereby indicating that at higher temperature longer duration may be detrimental, and, likewise, at long durations, higher temperatures may be detrimental.

Duration of pressing.—As indicated above, variations in the duration of pressing materially affect qualities of the finished board. Increased press time improved the water resistance but pressing for lengths of time beyond 15 minutes was found to cause the modulus of rupture values to drop below an acceptable value. Accordingly, an optimum time was determined to be about 8 minutes, considering economy of operation as a factor; otherwise, about 15 minutes.

Pressures.—Pressures may be varied over a range, for example, of 300 to 3000 pounds per square inch, which is customary in the art. The main consideration involved is that the pressure be sufficient to compress the fiber mat to a board of the desired thickness and density, being ordinarily about 1/8" and 60 lb./ft.³ in the case of structural hardboards. The two attributes do not necessarily occur concurrently, and since the thickness is the more critical from the standpoint of the consumer, the board thickness is preferably controlled exactly by use of predetermined stops and the desired density is obtained as nearly as possible by control of the charge, i. e., weight of the mat per unit area. It has generally been found that pressures in the range of 350 to 400 pounds per square inch are effective, although when stops are used on the press the pressure on the mat is not determinable without special apparatus. However, as hereinbefore pointed out, the pressure required for pressing to a prescribed density is correlated with the percentage of cork present, as, for instance, 400 pounds per square inch were required to produce 60 lb./ft.³ board 1/8" thick when only 7 1/2% cork is used, whereas 310-340 pounds per square inch pressure are sufficient when 25% cork is used. In other words, the pressure for any given amount of fiber material and predetermined board density and thickness is capable of being correlated with the capacity of the binding agent to flow. Accordingly, since increase in moisture content promotes flowability, it would also tend to reduce the pressure required for pressing.

In addition to the function of the cork as a binding agent, it serves a very important and useful function for providing water resistance to the board. Hardboards may be made from fiber without the use of any binder.

and with any one or more of many binding materials commonly employed in the prior art. However, the self-bound boards or boards bound with binding materials of the prior art other than the relatively expensive synthetic resins are subject to the disadvantage of having very low water resistance, i. e., high water absorption characteristics. The water absorption of a self-bound board when pressed at 300° F. for 15 minutes will range as high as 150%, based on the weight of the board. The addition of cork to the hardboard in the proportions of 15% cork and 85% fiber under the same pressing conditions produces a hardboard in which the water absorption has been reduced to approximately 61% and use of 40% cork lowered the water absorption to 42%. However, other factors also contribute to improvement of water resistance, such as increasing temperature and duration of pressing and moisture content of the pre-pressed mat as noted hereinbefore. Likewise, increase in density reduces water absorption, but, since board density is usually an objective requirement, it is not subject to variation for improvement of the water resistance. The best results for water resistance in a structural hardboard, when the critical factors of strength and economy are considered, is obtained when using 15% cork and 85% wood fiber, a mat of 20-25% moisture content, and pressing at 400° F. for 8 minutes. In such a board the water absorption is reduced to approximately 35%. A post-press conditioning of the hot pressed boards for one-half hour at 380° F. is effective to reduce water absorption to an average value of approximately 20%. The baking may be conducted over temperatures ranging from 250° to 400° F., and the resistance to water is improved as the temperature of baking is raised. However, baking at 380° F. and higher has a deleterious effect on strength properties when continued beyond one-half hour. This fact fixes the optimum baking limits at 380° F. and one-half hour duration, although, of course, both limits may be exceeded where greater water resistance is desired at the sacrifice of strength.

The manner of mixing the wood fiber and cork or whole bark has not been specifically pointed out herein, and may, obviously, be conducted by any one of numerous methods at the discretion of the operator. One variation which has been found to be particularly efficient, when Asplund defibrator fiber is used for the wood fiber, is to mix the cork with the chips as they are being fed to the defibrator machine. In this manner, thorough mixing is accomplished at the same time the fiber is being prepared.

CORE BOARD AND SIMILAR BOARDS

When the invention is applied to the manufacture of core boards, i. e., artificial boards which are to be used as the core for laminated structures in which the outer plies are, for example, veneers of wood, paper, plastic sheets or plastic coatings, structural strength for the core becomes of relatively less importance, but a high degree of water resistance is desired because such boards are frequently subjected to considerable moisture, as in the case of table tops. Screw holding ability and bonding strength are also important qualities. Hardness is a quality desired for some uses. Screw holding ability is, as its name implies, measured by the number of pounds of direct pull required to extricate a specified size screw from the board. Bonding strength as reported herein is a test of the resistance of the board to splitting or delamination as measured by impressing a ball of 1 cm. diameter into the edge of a board sample 1" x 1" and observing the maximum load of force required until splitting or separation of the lamina occurs.

Similar problems of formulation and processing, and similar objectives of quality to those involved in the manufacture of core board, are involved in the manufacture of surfacing or decorative boards to be used for mill work such as door panels, or for facings to replace

plywood and veneers, or for wainscot, sidewall decorative simulated tiles, and the like. Such boards are sometimes referred to as panel boards. In all such boards, structural strength is ordinarily of less importance than water resistance, screw-holding ability, and bonding strength. Accordingly, these boards may be considered as included in the discussion of the invention as applied to the manufacture of core board, the main difference being in the matter of surface appearance.

Boards made for the various purposes named above are fabricated over a wide range of densities, varying from about 30 lbs./ft.³ to as much as 80 lbs./ft.³. Thicknesses are used from 1/4 to 3/4 inch. As pointed out in the discussion of structural boards, flexural strength and water resistance are dependent upon board density. Water resistance is also dependent upon thickness of board, improving with increasing thickness probably due to diminishing penetrability. Accordingly, both board density and thickness must always be considered in evaluating water absorption results. However, since core boards and the like are not ordinarily designed for high flexural strength, variations in density may not greatly affect flexural strength. On the other hand, since water resistance is a prime objective in almost every case, the formulations and compounding are such that a high degree of water resistance will be obtained even at 30 lbs./ft.³ density. Increase in density results in increased water resistance in about a linear relationship.

Core boards, surfacing boards, and decorative boards are designed for such a wide variety of uses, as above pointed out, that no general standards of quality can be established, and the standard for specific uses may be limited to one or only a few of the various properties, such as water resistance and screw-holding ability. It may be said, however, that the flexural strength usually vary from about 250 to 3000 lbs./in.², and the resistance to water as measured by water absorption will be desired generally in a range from 20% down to less than 1%. Typical values of screw-holding ability are from about 50 to 400 pounds resistance to direct pull and for bonding strengths of from about 75 to 400 pounds load.

Wood particles for core boards and the like may be used over a wide range of particle size and shape, including uncomminuted hogged waste from furniture making and other wood working activities, sawdust, comminuted bark, sander flour, wood flour; vegetable fibers such as cotton, flax, cornstalks, and bagasse; mineral fibers such as asbestos and glass; and, of course, wood fibers of the Asplund or McMillan type may also be used.

The shape of the particle is more important than the size, from a structural strength standpoint; the more fibrous the particle, the greater the strength. However, the more fibrous particles such as McMillan and Asplund wood fibers are more expensive than such industrial waste materials as sawdust, sander flour and hogged waste. Since structural strength is usually of secondary consideration in core boards, and since economy is always an important consideration, resort is had in the manufacture of core boards to the cheaper wood particle materials, even though they are less fibrous by nature. It will be appreciated that the larger the particle size, the more pronounced its effect on surface appearance of the board. However, when the boards are to be used as the core of laminated structures, surface appearance is not of particular importance.

Proportions.—The cork and wood particles may be used over a wide range of proportions, extending from relatively small amounts of cork, as, for example, 5% to larger amounts including actually 100% of cork. Use of higher proportions of cork contributes to the production of boards of higher density than obtained when using smaller percentages of cork and larger percentages of wood particles. Two samples of 3/4" thick board compressed to 70 pounds density, made entirely from a Douglas fir bark fraction originally containing approxi-

9

mately 80% cork and 20% bast fibers and small amounts of wood, from which the wood impurity had been removed and which was ground to an average 80 mesh particle size, had modulus of rupture values of 1400 and 1800 lbs./in.² and water absorption values of .92 and .74%. For the best combination of strength, water resistance and cost for boards in the range from 30 to 50 pounds density, it is preferred to employ the cork as a binder for wood particles in proportions of from about 50% wood particles and 50% cork to 25% wood particles and 75% cork.

The effect of varying proportions of cork and hogged pine waste is well illustrated in Table IV below. The physical test values reported are corrected to a density of 50 lbs./ft.³. The hogged pine waste is a -14+65 mesh fraction and the cork is substantially pure Douglas fir, +48 mesh size. The boards were pressed at 400° F. for 10 minutes to 1/4" thickness by use of stops, and were cooled 10 minutes before removing from the press.

Table IV

	Varying Percentages of Cork					
	90 10	80 20	70 30	50 50	25 75	0 100
Hogged Waste						
Pure Cork						
Modulus of Rupture, lbs./in. ²	750	840	870	900	1,500	1,000
Water Absorption, percent	47	43	22	18	11	3.8
Hardness, R-scale	-52	-55	-55	-55	-55	-50

It will generally be observed from the above table that usages of 50% cork lowers the water absorption to 18%, 75% cork lowers water absorption to 11%, and 100% cork lowers water absorption to 3.8% for even a 50 pound density, 1/4" thick board. On another test using 50% hogged pine waste as received (without screening out the ±14 and -65 mesh particles) and 50% pure Douglas fir cork, a 50 pound density, 1/4" thick board had a modulus of rupture of 1000 pounds per square inch and water absorption of 15%.

Cork purity was found to have a sharply significant effect on board quality. The improvements in strength and water absorption values for boards of 40 lb./ft.³ density and 3/4" thickness to be obtained by the grinding of the cork and by the use of substantially pure cork (i. e. cork of about 98% purity) in contrast to a bark fraction containing approximately 80% cork and 20% bast fibers, wood and other impurities, are shown in the table below:

Table V

Material	Modulus of Rupture, p. s. i.	Water Absorption, percent
Douglas fir cork, 80% purity, +48 mesh size	120	8.8
Douglas fir cork, 80% purity, average 80 mesh size	150	6.3
Pure Douglas fir cork, +48 mesh	940	2.6

The results of Table V, above, were confirmed when tests were made on boards of 50 lbs./ft.³ density and 1/4" thickness compounded from equal proportions of uncomminuted hog waste and a cork material, as shown in Table VI, below.

Table VI

Material	Parts, percent	Modulus of Rupture, p. s. i.	Water Absorption, percent
Hogged waste	100	250	250
Hogged waste	50	280	50
Douglas fir cork, 80% purity, wood impurity removed, +14 mesh size	50		
Hogged waste	50	800	19
Pure Douglas fir cork, +48 mesh	50		

10

It will be noted in Table VI, above, that the addition of cork, whether pure or impure, to hogged waste, improves the flexural strength and water resistance properties, the improvement in water resistance varying from 250% water absorption in the case of 100% hogged waste to 19% when the board is made of 50 hogged waste and 50% pure Douglas fir cork. The difference between the use of substantially pure cork and cork of 80% purity in the 50-50 mix with hogged waste raises the modulus of rupture values from 280 to 800 pounds per square inch.

The processing of the materials to form core boards is about the same as in the case of structural hardboards, with this difference: There is little or no felting. The materials are mechanically mixed together, and then the "mass" of particles, in contrast to the felted "mat" when wood fibers are being used to make structural hardboards, is placed in a suitable mold, and pressures of the order of from 100 to 1500 pounds per square inch are applied. Temperatures are maintained in the range of 250° to 400° F., with the higher temperatures being preferred. Pressing durations may vary from 5 minutes to 1 hour, or even longer, but usually 10 minutes are sufficient for the hot pressing. Unlike the structural hardboards, the press or mold must usually be cooled for from 10 minutes to longer periods before removing the pressed board, in view of the relatively large percentages of cork employed, and the thermoplasticity of the cork. Processing conditions were stated for the boards tested and reported in Table IV herein. The boards tested and reported in Table V were pressed to stops for 3/4 inch thickness and at 400° F. for 10 minutes and cooled before removal from the press. The boards tested and reported in Table VI were pressed to stops for 1/4" thickness and at 400° F. for 10 minutes, and cooled 10 minutes before removing from the press.

As in the case of structural hardboards, resins may be added in minor proportions to improve strength properties of the boards. Both thermoplastic and thermosetting and both natural and synthetic resins may be used. Use of resins, even in small percentages, contributes to increasing the density of the board under the otherwise same conditions of pressing.

It is to be understood that various modifications and equivalents may be used in the practice of the invention, and that the invention lends itself to the various processing techniques of the art and to various applications of utility known in the art.

What is claimed is:

1. A hard rigid board of the character of lumber comprising a closely compacted heat-bonded mixture originally of wood particles and particles of isolated cork originating in the bark of coniferous trees, said cork being present in an amount equal to at least 5% of the mixture and said wood particles being present in amount in the range from 25% to 95% of the mixture.

2. A hard rigid board of the character of lumber comprising a closely compacted heat-bonded mixture originally of wood particles, particles of the bark of coniferous trees, and particles of isolated cork originating in such bark, said cork being present in an amount equal to at least 5% of the mixture and said wood particles being present in amount in the range from 25% to 95% of the mixture.

3. A hard rigid board of the character of lumber comprising a closely compacted heat-bonded mixture originally of wood particles and particles originating in the bark of coniferous trees, the mixture comprising by dry weight from 25% to 95% of said wood particles, and the remainder being said particles from the bark and including particles of isolated cork in amount of at least 5% of the mixture.

4. The product of claim 3 in which the wood particles are comprised of wood fiber containing substantially all the substance of the raw wood from which the fiber is

11

derived and the particles of bark having a size distribution to pass through an 80 mesh screen.

5. The product of claim 4 wherein the wood fiber is present in amount by weight in the range from 60 to 95 parts and the particles from the bark are correspondingly present in amount in the range from 40 to 5 parts.

6. A method of making a hot pressed hard rigid board of the character of lumber comprising the steps of admixing wood particles and a separated cork fraction of the bark of coniferous trees, the latter being in an amount of at least 5% of the mixture, and pressing the mixture under conditions of heat, pressure and time sufficient to increase the density of the mixed mass into a hard compact board and to cause the cork component to flow into intimate bonding admixture with the wood particles.

7. A method of making a hot pressed hard rigid board of the character of lumber comprising the steps of admixing wood particles, comminuted bark of coniferous trees and a separated cork fraction of said bark, the latter being in an amount of at least 5% of the mixture and pressing the mixture under conditions of heat, pressure and time being sufficient to increase the density of the mixed mass into a hard compact board, and to cause the cork component to flow into intimate bonding admixture with the wood particles and bark.

8. The method of claim 7 in which the pressing is continued at approximately 400 pounds per square inch and at a temperature of from 250° to 400° F. for a period of time of from 5 to 15 minutes.

9. The method of claim 7 together with the step of baking the compressed board after removal from the hot press in an oven at a temperature of about 380° F. for a period of about ½ hour.

10. A method of making hot pressed hard rigid board of the character of lumber from a mixture of wood fibers, comminuted material originating in the bark of coniferous trees, said material including particles of isolated cork in amount of at least 5% by weight of the mixture; said method comprising mixing and felting the wood fiber and comminuted bark and cork component, adjusting the moisture content of the felted mat to from 20 to 25%, pressing the felted mat under conditions of heat, pressure and time sufficient to increase the density thereof to a hard compact mass and to cause bark material to flow into intimate bonding admixture with the wood particles and removing the pressed board from the press.

11. A method of making a hot pressed hard rigid board of the character of lumber from a mixture of wood fibers, comminuted bark of coniferous trees and at least 5% by weight of the mixture of particles of isolated cork originating in such bark, said method comprising adjusting the moisture content of the wood fibers to from 20 to 50% oven dry basis and the moisture of the bark and cork component to from 5 to 20% oven dry basis before admixing the materials; mixing and felting the wood fiber, bark and cork component, adjusting the moisture content of the fiber mat to from 20 to 30%, pressing the felted mat under conditions of pressure, temperature and time sufficient to increase the density of the mat into a hard compact board and to cause bark material to flow into intimate bonding admixture with the wood fiber.

12. A method of making a hot pressed hard rigid board of the character of lumber comprising admixing with a major proportion of wood particles a minor proportion of comminuted bark of coniferous trees and articles of isolated cork originating in such bark in an amount of at least 5% of the mixture, felting the mixture to form a mat, pressing the mat under conditions of heat, pressure, and time sufficient to increase the density of the mat into a hard compact board and to cause bark material to flow into intimate bonding admixture with the wood particles.

13. A method of making a hot pressed hard rigid board

12

of the character of lumber from a mixture of wood fibers, comminuted whole bark of coniferous trees and a separated cork component originating in such bark wherein the wood fiber is used in the ratio of about 85 parts of wood fiber to 15 parts of bark material of which at least 5 parts is said cork component, adjusting the moisture content of the wood fiber to 20 to 50% and the moisture of the bark and cork component to 5 to 20% before admixing the materials, mixing and felting the wood fiber, bark and cork component particles, adjusting the moisture content of the felted mat to 20 to 30%; pressing the felted mat at a pressure of the order of 400 pounds per square inch and at a temperature of approximately 400° F. for a period of from 5 to 15 minutes and removing the pressed board from the press.

14. A method of making a hot pressed hard rigid board of the character of lumber from a mixture of wood fibers, comminuted whole bark of coniferous trees and particles of isolated cork originating in such bark, wherein the wood fiber is used in a ratio of about 85 to 15 parts of the bark material comprising at least 5 parts of said isolated cork, which comprises felting the wood fiber and bark material to form a mat, adjusting the moisture content of the felted mat to 20 to 30%, pressing the felted mat at a pressure of the order of 400 pounds per square inch and at a temperature of approximately 400° F. for a time period of from 5 to 15 minutes and removing the pressed board from the press.

15. A method of making a hot pressed hard rigid board of the character of lumber comprising the steps of admixing wood particles, comminuted bark of coniferous trees and particles of isolated cork originating in such bark, said cork particles being present in amount which is at least 5% by weight of the mixture, and pressing the mixed particles under conditions of heat, pressure and time sufficient to increase the density of the mixed mass into a hard compact board and to cause the bark material to flow into intimate bonding admixture with the wood particles.

16. The invention of claim 15 in which the pressing is continued in a range of from 100 to 1500 pounds per square inch at a temperature of from 250° to 430° F. and for a period of time of from 5 to 60 minutes.

17. A method of making a hot pressed rigid board of the character of lumber comprising the steps of admixing approximately 25 to 50 parts of wood particles and approximately 50 to 75 parts of comminuted bark of coniferous trees, including not less than 5% of a separated cork component of such bark, and pressing the mixed particles under conditions of heat, pressure and time sufficient to increase the density of the mixed mass into a hard compact board, and to cause the cork component to flow into intimate bonding admixture with the wood particles.

18. A method of making a hot pressed hard rigid board of the character of lumber comprising the steps of admixing approximately 25 to 50 parts of wood particles and approximately 50 to 75 parts of comminuted material originating in the bark of coniferous trees of which material at least 5 parts consists of particles of isolated cork, pressing the mixed particles under a range of pressure of from 100 to 1500 pounds per square inch at a temperature of from 250° to 430° F. for a period of time of from 5 to 60 minutes, and cooling the mold for a period of time until the compressed board has become hard enough to facilitate removal from the mold.

19. An artificial hard rigid board of the character of lumber comprising a heat-bonded mixture originally of wood particles in an amount upwardly from 25% of said mixture, comminuted bark of coniferous trees and a separated cork component originating in such bark in an amount of not less than 5% by weight of the mixture, said board having a density of not less than 30 or more than 80 pounds per cubic foot, a modulus rupture of not

24,174

13

less than 4000 pounds per square inch, and having a water absorbing capacity of not more than 25%.

References Cited in the file of this patent

UNITED STATES PATENTS

2,319,182 Vander Pyl ----- May 11, 1943

2,348,081

2,380,214

2,402,554

2,437,672

5 2,446,304

2,446,551

14

Linzell ----- May 2, 1944

Burell ----- July 10, 1945

Irvine et al. ----- June 25, 1946

Anway ----- Mar. 16, 1948

Roman ----- Aug. 3, 1948

Pauley ----- Aug. 10, 1948

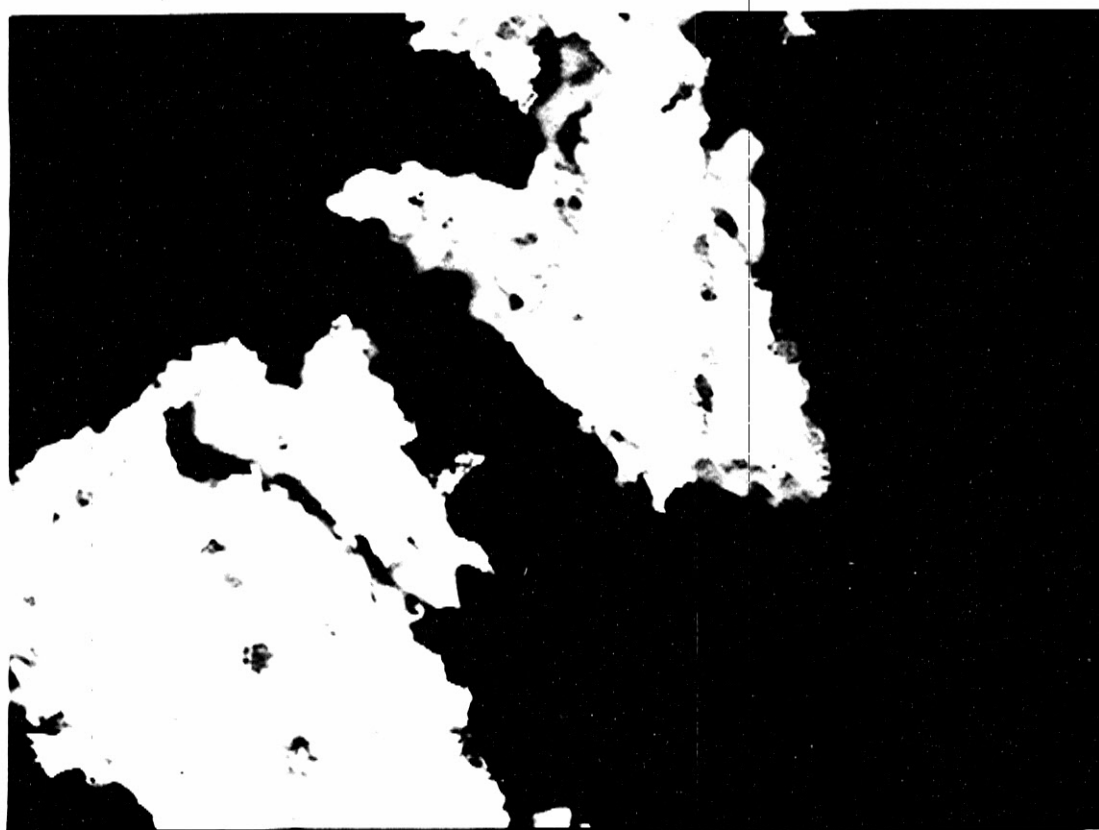
CORK PARTICLE

FIBER



CORK PARTICLE IN LIGHTHALL-ANDERSON
FIBER-
MANIFICATION APPROXIMATELY 100X

10
CORK PARTICLE



CORK PARTICLE TAKEN FROM DOUGLAS FIR
BARK
APPROXIMATELY 100X

Excerpts From Defendant's Exhibit 1, File Wrapper In
Lighthall-Anderson Patent Application

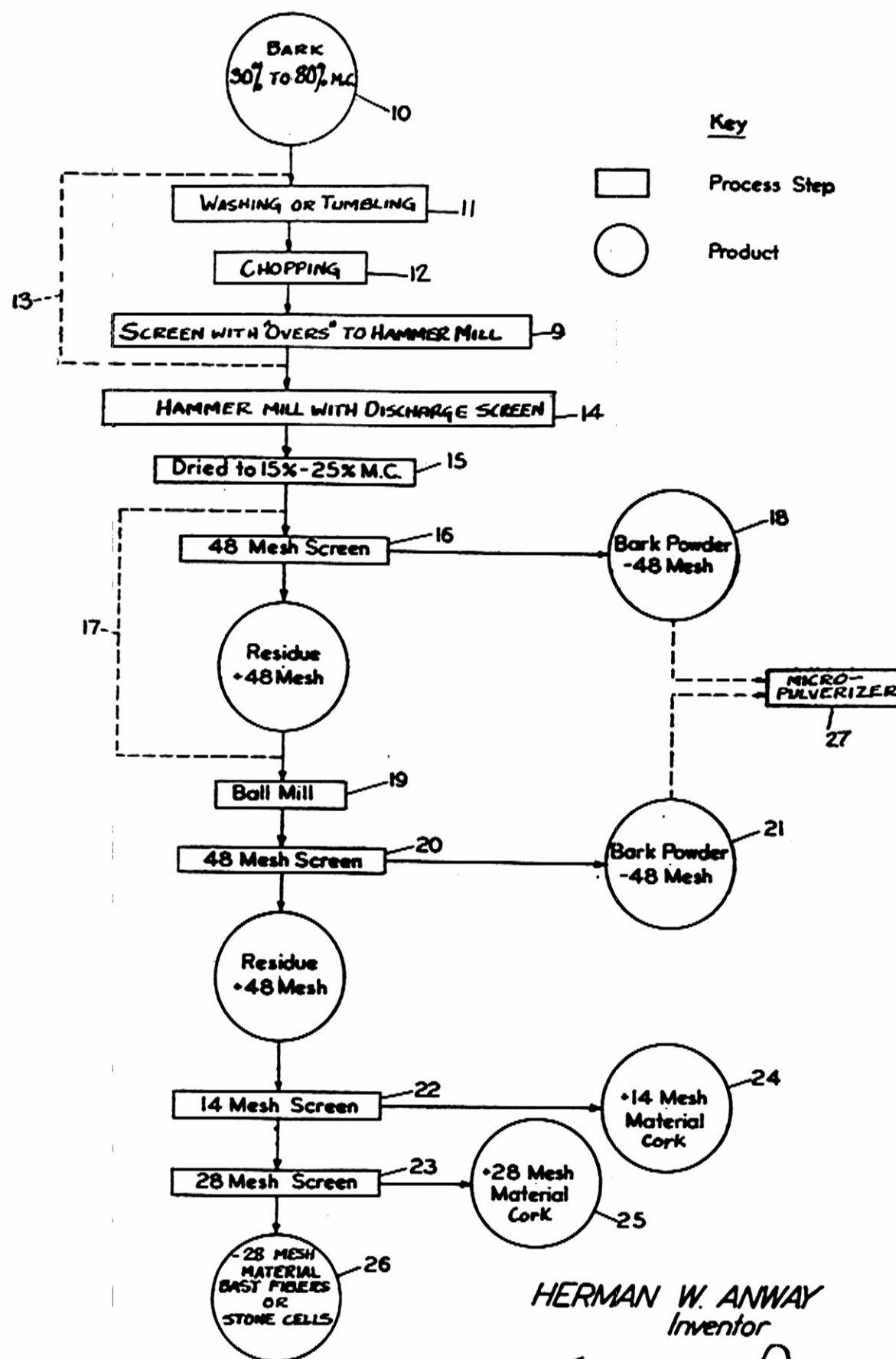
March 16, 1948.

H. W. ANWAY

2,437,672

METHOD OF TREATING BARK

Filed Sept. 27, 1944



HERMAN W. ANWAY
Inventor

By *Harold D. Cook*
Attorneys

UNITED STATES PATENT OFFICE

2,437,672

METHOD OF TREATING BARK

Herman W. Anway, Cloquet, Minn., assignor to
Weyerhaeuser Timber Company, Longview,
Wash., a corporation of Washington

Application September 27, 1944, Serial No. 556,097

6 Claims. (Cl. 241-14)

1

This invention relates to the treatment of bark, and has particular reference to a method of treating bark for recovering therefrom a plurality of bark fractions having requisite purity for commercial use.

In general, the barks of trees comprise periderm, phellem or cork, and phloem which consists of a collection of sieve tubes and parenchyma, and frequently bast fibers or stone cells. Pieces of bark from separate trees show a wide variation of relative amounts of cork and phloem, grading from pieces consisting almost entirely of phloem and having but thin lunes of cork, to those consisting of large masses of cork or phelloderm with small islands of phloem existing in the cork. Microscopically, the phellem or cork is composed of layers of non-elongated suberized cells partially filled with air and of low specific gravity. The constituents of the phloem are longitudinal cells comprising sieve tubes, frequently bast fibers or stone cells, phloem parenchyma, and radial cells comprising ray parenchyma.

The invention is predicated upon the discovery that by adjusting the friability of a bark matrix, a suitable comminuting process (as ball milling) may be employed to differentially pulverize the constituents of the bark to break the bond therebetween and so permit separation thereof by selective screening. The invention is productive of various classes of materials, each of which may be recovered substantially free from mixture or contamination.

The first of these materials is the phellem or cork developed each year by the phellogen or cork cambium. The phellem or cork consists of non-elongated thin and thick walled cells converted into cork tissue by development of suberin. The thin walled cells probably are not heavily suberized and tend to collapse in the radial direction. The cork cells are partially filled with air and are of low specific gravity.

The second class of materials to be found in certain barks, Douglas fir in particular, comprises a tough fibrous portion of the phloem known as bast fiber. This material is resistant to destruction by milling processes and is recovered in the form of individual hard fibers. For purposes of the instant disclosure, this material is referred to as bark fiber, and largely comprises the intermediate fraction between the cork fraction and the bark powder fraction. At low moisture content these fibers tend to maintain their identity, even when subjected to the

2

severe pulverizing action by which other portions of the phloem are reduced to powder.

A third class of materials is that herein classified as bark powder, being composed initially of sieve tubes and other portions of the phloem exclusive of the bast fibers. This material readily disintegrates under the action of a ball mill at a moisture content at which the cork and bark fiber fractions are highly resistant to disintegration. A chemical analysis of the bark powder discloses that it comprises lignin in major proportion.

The lignin in the bark is a naturally occurring lignin having excellent properties of flowability and of plasticity. It is believed that these properties are present by reason of the fact that the bark powder has had none of the treatments by which lignin is prepared from wood by known commercial processes, and so is unaltered by the severe chemical treatments generally employed to produce lignin or lignin-enriched extenders. Moreover, the bark powder contains ether soluble bodies of wax-like material which, in their natural state, impart flowability under hot compression and water resistance to a hot molded product comprising the bark powder as a principal ingredient. By reason of these properties, the bark powder is plastic in character and is especially adapted for use as the principal ingredient of molding compounds for the manufacture of plastics.

In the practice of the invention, bark may be stripped from logs and chopped or otherwise broken up to facilitate feeding the bark to a hammer mill or other suitable grinding equipment for converting the bark into a substantially uniform mass of bark particles. The purpose of this step is to so reduce the particle size of the bark as to provide for control of its moisture content in a continuous process of producing the several bark fractions. It is recommended that the moisture content of the bark to be ground be from 30% to 80%, based on the weight of the dry bark. After the grinding step the moisture content of the ground bark is adjusted to enhance destruction of the bond between the several bark constituents by comminution, and so permit separation thereof by selective screening.

It is, therefore, the principal object of the invention to provide a method of treating bark for recovering therefrom a plurality of bark fractions having requisite purity of separation for commercial use.

It is a further object of the invention to pro-

3

vide a method of treating bark for recovering therefrom bark powder comprising potentially reactive lignin in major proportion.

It is a further object of the invention to provide a method of treating bark for recovering therefrom bark fractions comprising cork, bast fibers or stone cells, and bark powder as separate fractions.

It is a further object of the invention to provide a method of producing commercially useful bark fractions by controlling the friability of the bark throughout a plurality of comminuting steps.

For purposes of the instant invention, the bark may be stripped from logs, the stripping preferably being accomplished soon after the trees are cut and before evaporation of the sap from the logs causes the bark to become cemented tightly to the wood. Since it is preferred that the moisture content of the bark to be ground be from 30% to 80%, based on the weight of the dry bark, the bark may be used as stripped from the logs taken from a mill pond without any adjustment in its moisture content.

The bark removed from logs may contain rotted bark, sawdust, wood splinters, sand and other extraneous matter. It is recommended that the bark be washed and roughly handled or tumbled to remove sand and other loosely adhering matter for preventing undue wear of blowers and other processing equipment, as well as avoiding contamination of the bark fractions. For convenience in handling, and to provide for separation of particles of rotted bark and other extraneous matter, it is recommended that the bark be chopped or broken into pieces which may conveniently be fed to a hammer mill or other grinding apparatus. If purity of product is essential, the bark may be screened prior to delivery to the grinding apparatus, the screen openings being selected to pass smaller particles of rotted bark, sawdust and other impurities, as well as sand loosened by the chopping or breaking action, the quality and uniformity of the final product being improved in relation to the cleanness of the bark delivered to the grinding apparatus.

Grinding is accomplished as, for example, in a hammer mill equipped with a screen for converting the bark into a substantially uniform mass of bark particles. The product of the hammer mill is a mass of bark particles of fairly uniform size and consisting approximately of the same constituents which compose the whole bark, although some of the phloem constituents will be found to be finely comminuted during the grinding operation. The purpose of this step is to produce increments or matrices of such size as to permit rapid adjustment of their moisture content, in order that friability of these matrices may be controlled during subsequent operations.

The ground bark may be exhausted into a collection chamber by means of a blower connected into the discharge from the grinder, the collection chamber preferably being of the type commonly known as a cyclone wherein the stream of air generated by the blower is separated from the flow of bark particles and exhausted to atmosphere.

It is the teaching of this invention that, after conversion of the whole bark slab into a substantially uniform mass of bark particles, as in the grinding step, further comminution of the bark be performed at a reduced but controlled moisture content in order that the friability of the bark may suitably be adjusted to enhance differential

4

pulverization of the several bark constituents and destruction of the bond therebetween. It has been discovered that the phellem or cork fraction may most easily be separated from the bark matrix by a comminuting process carried on at a moisture content above 15%. Below 15% the yield of cork, as easily separated larger particles, drops off rapidly, whereas the sieve tubes become increasingly friable, producing an increasing yield of bark powder and similarly increasing yield of bast fibers or stone cells as the residue of the bark matrix, the bast fibers being highly and increasingly resistant to comminuting action as their moisture content is reduced. The gist of the invention is to be found in a method of treating bark comprising the steps of initially grinding the bark at a high moisture content, and thereafter drying the bark for progressively controlling the friability of the bark matrices so that selective separation of the several bark fractions may be obtained in a continuous process.

In one form of apparatus for practicing the invention, reduction of moisture content of the bark matrices produced by the hammer mill is accomplished by conveying the ground bark by means of a stream of heated air. The contact of heated air with the surfaces of the bark particles conveyed thereby results in controlled evaporation of the moisture contained in the bark, the temperature and rate of flow of the air being so adjusted as to accomplish a reduction in the moisture content of the bark particles to the order of 15% to 25%, based on the dry weight of the bark. In an apparatus in which the drying step is accomplished by means of a heated air stream, the bark may preferably be discharged into a second collection chamber of the cyclone type, in which the bark particles are subjected to a vertical action for separating the bark from the moist air and from which the air is discharged to atmosphere.

At this point in the process the ground bark particles may be delivered onto a vibrating screen or to other type of separator for separating therefrom any finely pulverized material which may have been produced thus far in the process. In the event a screen is employed, it may suitably be a single deck Hummer screen having a 48 mesh (0.0116" diameter openings) screen. The minus-48 mesh material recovered by this screen is identified herein as bark powder, and is conveyed to a place of storage or to apparatus for subsequent treatment, as may be desired. For example, for certain uses it is desired that the bark powder be further pulverized, and the bark powder fraction intended for such uses is delivered to a micro-pulverizer for that purpose. The plus-48 mesh material is subjected to a controlled pulverizing action as in a ball mill, the moisture content of the material being fed to the ball mill being preferably 15% to 25%, depending upon the quality of the product to be recovered. The rate of treatment in the ball mill is in part determined by the moisture content of the material being fed to the mill.

As is indicated hereinabove, the cork fraction of the bark may be disengaged from the bark matrix at a relatively high moisture content, whereas complete disengagement of the intermediate fraction is accomplished only after a prolonged and severe pulverizing action, which may be shortened in time only by reduction in moisture content of the matrices below that at which the cork particles are disengaged. The sieve tubes and other portions of the phloem,

5

exclusive of the bast fibers or stone cells, having been disengaged from the other constituents which originally comprised the bark matrix, are finely comminuted by action of the ball mill, the rate of yield of a minus-48 mesh fraction, herein identified as bark powder, increasing steadily, but at the expense of purity, as the moisture content is lowered.

The product discharged from the ball mill is fed directly to separating apparatus arranged in series, as, for example, onto a series of Tyler Hammer vibrator screens, the first of these screens being a single deck 48 mesh screen similar in all respects to the screen onto which the ground and partially dried bark is delivered from the second collection chamber. The minus-48 mesh product separated by this screen is conducted to the place of storage or to subsequent treating apparatus together with the separated product recovered by the previous screen. The plus-48 mesh material may be delivered over second and third screens in this series, the second screen being a 14 mesh (0.046" diameter opening) screen, and the third screen being a 28 mesh (0.0232" diameter opening) screen. The fractions recovered as the product passes over the second and third screens are designated "plus-14" and "plus-28," these two fractions consisting largely of cork, the minus-28-plus-48 mesh material (product 26) consisting largely of the bast fibers or stone cells which comprise the intermediate fraction.

The following table is indicative of the yield to be had from the bark of Douglas fir trees having an average cork content:

Table

Material	Moisture Content, per cent	Pounds	Yield, per cent total
Raw Bark Chips.....	50-80	2,418	
#1 +14 mesh } cork (products 24 plus 25)	22	81	4
#2 +28 mesh }	20	297	15
#3 +48 mesh, Intermediate (product 26)	19	364	18
#4 -48 mesh, bark powder (products 18 plus 21).....	17	1,279	63
		2,021	100

It will be noted that the recovered fractions total 2021 pounds, indicating a loss of approximately 16%, based on the weight of the raw material. It is believed that this loss may partially be accounted for by the evaporation of water from the bark during the processing steps.

Applicant's method of treating bark is illustrated on the accompanying drawing illustrating a flow chart in which the circle 10 represents natural whole bark in the condition in which it is received at a bark plant. The bark 10 is separated easily from spring and summer cut logs, and a stock pile of bark may be accumulated without the necessity of using a rossing machine or the like for stripping the bark from the log. Since the bark may often be taken from logs which are floated to the mill, further washing or tumbling of the bark may be wholly unnecessary. Moreover, the bark received at the bark plant may be broken sufficiently to be fed directly to the hammer mill for the initial grinding step. For these reasons, the drawing illustrates the invention as a process which commences with the product, bark, which may be subjected to a grinding action as the first step 14 of the process. Alternatively, the bark may be subjected to a washing or tumbling action, indicated at 11, and may be chopped

6

or suitably broken up, as at 12, and screened to eliminate rotted bark, sawdust and other impurities, according to the condition in which it is received at the plant. The screening step, from which the "overs" are delivered to the hammer mill, is indicated at 9. It will be understood, however, that the washing or tumbling and chopping and screening steps may be omitted, as is indicated by the line 13.

In the drawings the initial grinding step is indicated at 14, and the initial drying step at 15, after which the ground and partially dried bark may be subjected to a screening or other separating action, as indicated at 16, for the recovery of finely comminuted material 18 which may have been produced thus far in the process. The residual material is subjected to a comminuting action at 19, or the separating step 16 may be omitted from the process and the entire product of the drying step be further comminuted as is indicated by the line 17.

The product of the comminuting step 19 is separated at 20 to recover finely comminuted material 21, and the residue is further separated at 22 and 23 to recover cork fractions 24 and 25 and fiber or stone cells 26. The minus 48 mesh material, or any portion thereof, may be fed to a micro-pulverizer 27 or other apparatus for subsequent treatment, as desired.

No limitation is intended by reference to a particular type of apparatus for practicing the method of the invention, the scope of the invention being determined solely by the breadth and scope of the appended claims. For example, in place of the screens described herein as being employed for separating the bark fractions, centrifugal separating means may be used wherein the bark fractions are caught in a vortex of gaseous media, such as air, and are separated therefrom according to their specific gravities and particle size and the action of centrifugal and centripetal forces.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. The method of treating bark for the production of cork, fiber and bark powder, which comprises grinding said bark to provide an aggregate of bark matrices of not to exceed a predetermined size and consisting essentially of the several constituents of the whole bark, adjusting the moisture content of said matrices to a value not substantially less than 15% nor more than 25%, based on the weight of the dry bark, disuniting fiber bundles, cork and the non-fibrous portion of the phloem, finely comminuting the non-fibrous portion of the phloem, and reducing the fibrous portion of the phloem to ultimate fibers without substantial comminution of the cork and individual fibers, for promoting selective segregation of the cork, ultimate fibers and finely comminuted portion of the phloem.

2. The method of treating bark for the production of cork, fiber and bark powder, which comprises selecting bark having a moisture content of not substantially less than 30% nor more than 80% based on the weight of the dry bark, grinding said bark to provide an aggregate of bark matrices of not to exceed a predetermined size, adjusting the moisture content of the bark matrices to a value at which, in a subsequent comminuting step, a cleavage is effected between the several constituents of the bark, subjecting said matrices to a comminuting action to accomplish substantial reduction in particle size of the non-fibrous con-

stituents of the phloem, disuniting fiber bundles, cork and the non-fibrous portion of the phloem, and reducing the fibrous portion of the phloem to ultimate fibers without substantial comminution of the cork and individual fibers, for promoting selective segregation of the cork, ultimate fibers and finely comminuted portion of the phloem.

3. The method of treating bark for the production of cork, fiber and bark powder, which comprises selecting bark having a moisture content of a value to promote comminution to an aggregate of bark matrices of not to exceed a predetermined size and consisting essentially of the several constituents of the whole bark, grinding said bark to provide an aggregate of bark matrices of not to exceed said predetermined size, adjusting the moisture content of the bark matrices to a value at which, in a subsequent comminuting step, a cleavage is effected between the several constituents of the bark, disuniting fiber bundles, cork and the non-fibrous portion of the phloem, finely comminuting the non-fibrous portion of the phloem, and reducing the fibrous portion of the phloem to ultimate fibers without substantial comminution of the cork and individual fibers, for promoting selective segregation of the cork, ultimate fibers and finely comminuted portion of the phloem.

4. The method of treating bark for the production of cork, fiber and bark powder, which comprises selecting bark having a moisture content of a value not substantially less than 30% nor more than 80% based on the weight of the dry bark to promote comminution to an aggregate of bark matrices of not to exceed a predetermined size and consisting essentially of the several constituents of the whole bark, grinding said bark to provide an aggregate of bark matrices of not to exceed a predetermined size, adjusting the moisture content of said matrices to a value not substantially less than 15% nor more than 25%, based on the weight of the dry bark, disuniting fiber bundles, cork and the non-fibrous portion of the phloem, finely comminuting the non-fibrous portion of the phloem, and reducing the fibrous portion of the phloem to ultimate fibers without substantial comminution of the cork and individual fibers, for promoting selective segregation of the cork, ultimate fibers and finely comminuted portion of the phloem.

5. The method of producing cork, fiber and bark powder from the barks of trees comprising grinding said bark to provide an aggregate of bark matrices of not to exceed a predetermined size, adjusting the moisture content of the bark matrices to a value at which, in a subsequent comminuting step, a cleavage is effected between the

several constituents of the bark, disuniting fiber bundles, cork and the non-fibrous portion of the phloem, finely comminuting the non-fibrous portion of the phloem, reducing the fibrous portion of the phloem to ultimate fibers without substantial comminution of the cork and individual fibers, and selectively segregating the ultimate fibers, particles of cork and the finely comminuted phloem.

6. The method of producing cork, fiber and bark powder from the barks of trees comprising grinding said bark to provide an aggregate of bark matrices of not to exceed a predetermined size, adjusting the moisture content of said matrices to a value not substantially less than 15% no more than 25%, based on the weight of the dry bark, disuniting fiber bundles, cork and the non-fibrous portion of the phloem, finely comminuting the non-fibrous portion of the phloem, reducing the fibrous portion of the phloem to ultimate fibers without substantial comminution of the cork and individual fibers, selectively segregating the cork, individual fibers and finely comminuted non-fibrous portion of the phloem.

HERMAN W. ANWAY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,870,166	Bond	Aug. 2, 1932
1,274,728	McCoy	Aug. 6, 1918
1,870,166	Bond	Aug. 2, 1932
2,175,484	Rees	Oct. 10, 1939
1,771,477	Alton	July 29, 1930
2,286,643	Phillips	June 16, 1942
2,319,182	Vander Ryl	May 11, 1943
1,455,762	Howard	May 15, 1923
1,797,901	Darling	Mar. 24, 1931

FOREIGN PATENTS

Number	Country	Date
420,447	France	Feb. 4, 1890

OTHER REFERENCES

Industrial and Engineering Chemistry, Aug. 1944 (pp. 759-764), 106-163.

Wise-Wood Chemistry, Reinhold Pub. Co., New York, 1944 (pp. 9-10).

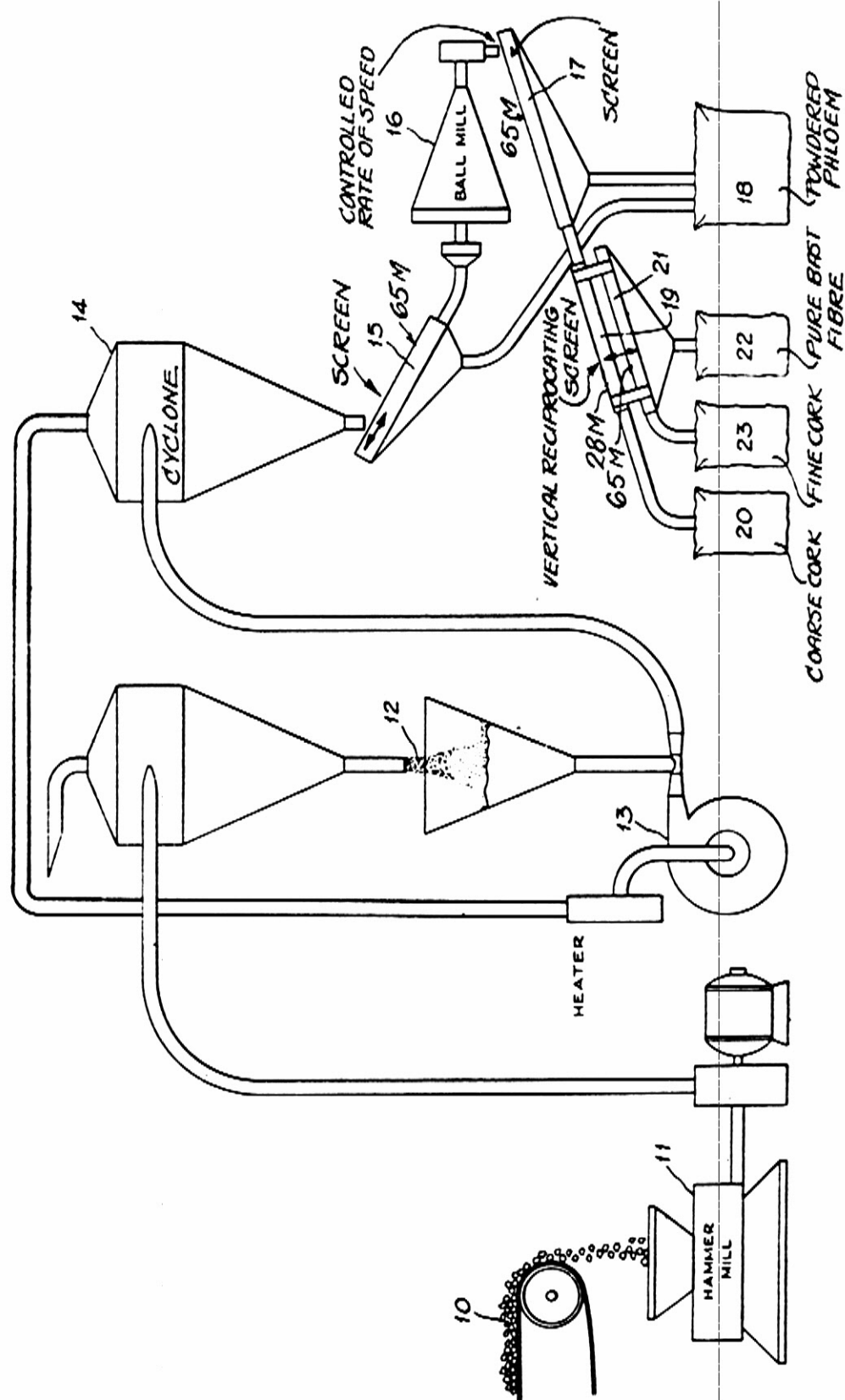
"Profitable Use of Testing Sieves", 1940 edition, catalogue 53 of W. S. Tyler Co., Cleveland, Ohio, pp. 40 and 42, 209-237.

Handbook of Ore Dressing, by Taggart, 1927 edition, John Wiley & Sons Publishers, p. 1184. (Copy in Div. 25.)

Aug. 10, 1948.

R. D. PAULEY
SEPARATION OF PURE BARK FIBER
FROM FINELY COMMUNUTED BARK
Filed Oct. 19, 1945

2,446,551



ROBERT D. PAULEY
INVENTOR

Carroll D. Cook
ATTORNEY

BEST COPY

UNITED STATES PATENT OFFICE

2,446,551

SEPARATION OF PURE BARK FIBER FROM
FINELY COMMUNUTED BARKRobert D. Pauley, Longview, Wash., assignor to
Weyerhaeuser Timber Company, Longview,
Wash., a corporation of Washington

Application October 19, 1945, Serial No. 623,251

7 Claims. (Cl. 209—235)

1

This invention relates to the treatment of bark and has particular reference to an improved method of treating Douglas fir bark to produce a substantially pure and clean bark fiber fraction.

In general, the barks of trees comprise phellogen, phellem or cork, and phloem which consists of a collection of sieve tubes and parenchyma, and frequently bast fibers or stone cells. Pieces of bark from trees show a wide variation of relative amounts of cork and phloem grading from pieces consisting almost entirely of phloem and having but thin lunes of cork to those consisting of large masses of phellem or cork with small islands of phloem existing in the cork. Microscopically, the phellem or cork is composed of layers of non-elongated suberized cells partially filled with air and of low specific gravity. The constituents of the phloem are longitudinal cells comprising sieve tubes, frequently bast fibers or stone cells, phloem parenchyma, and radial cells comprising ray parenchyma.

It has been discovered that by adjusting the friability of the bark matrix, a suitable comminuting process such as ball milling may be employed to differentially pulverize the constituents of the bark to break the bond therebetween and so permit separation thereof by selective screening. Such separation is productive of various classes of materials, each of which may be recovered as a fraction substantially free from mixture or contamination.

The first of these materials is the phellem or cork developed each year by the phellogen or cork cambium. The phellem or cork consists of non-elongated thin and thick walled cells converted into cork tissue by development of suberin. The thin walled cells probably are not heavily suberized and tend to collapse in the radial direction. The cork cells are partially filled with air and are of low specific gravity.

The second class of materials to be found in certain barks, Douglas fir in particular, comprises a tough fibrous portion of the phloem known as bast fiber. This material is resistant to destruction by milling processes and is recovered in the form of individual hard fibers. For purposes of the instant disclosure, this material is referred to as bark fiber, and largely comprises a fraction having a coarseness intermediate between the cork fraction and the bark powder fraction. At low moisture content these fibers still tend to maintain their identity, even when subjected to the severe pulverizing action by which other portions of the phloem are reduced to powder.

A third class of materials is that herein classi-

2

fied as bark powder, being composed essentially of sieve tubes and other portions of the phloem exclusive of the bast fibers. This material readily disintegrates under the action of a ball mill at a moisture content at which the cork and bark fiber fractions are highly resistant to disintegration.

A method of separating and recovering these three materials is disclosed in an application for United States Letters Patent, Serial No. 556,097, filed September 27, 1944, now Patent No. 2,437,672 dated March 16, 1948, in the name of Herman W. Anway and having common assignee with the instant application. The present invention relates in general to the method therein disclosed and has as its object to provide an improved method of treating Douglas fir bark to produce a pure bark fiber fraction.

In experimenting with the formulation of molding compounds employing bark products, it is found that each of the three classes of materials above mentioned imparts certain definite characteristics to articles molded therefrom, and that different characteristics may be obtained at will by using one or more of these materials in variant proportions in thermosetting molding compounds. In order to standardize and reproduce such formulations it is necessary, therefore, to separate these materials into relatively pure fractions. The present invention is concerned only with the fiber fraction. The bark powder and cork fractions are also produced and separated in the course of the process.

The method of the invention will now be described with reference to the single figure of the drawing, illustrating diagrammatically the functional steps in the process.

In the practice of the invention, bark may be stripped from logs and chopped or otherwise broken up to facilitate feeding the bark to a hammer mill or other suitable grinding equipment for converting the bark into a substantially uniform mass of bark particles. Prior to the grinding step it is desirable to wash the bark for removing therefrom particles of rotten bark, sand, dirt and other extraneous matter. During or after the washing operation the chopped bark is preferably screened, the screen openings being selected to pass and eliminate smaller particles of rotted bark and foreign materials. The principal purpose of the grinding step is to so reduce the particle size of the bark as to provide for control of its moisture content in a continuous process of producing the several bark fractions. Further purposes of the grinding step are to pro-

3

duce a particle size which is suitable for ball milling and which renders the bark readily transportable in pipes or ducts under blower action. Transportation in this manner also reduces the moisture content of the material as it moves along, so as to lessen the requirement for special drying equipment. It is recommended that the initial moisture content of the bark to be ground be from 30% to 80%, based on the weight of the dry bark.

In the grinding step the raw whole bark 10, washed clean of undesirable matter, is fed into a hammer mill 11 which breaks up the pieces of bark and discharges its product through a screen of approximately $\frac{1}{4}$ " mesh. The product of the hammer mill is, therefore, a mass of bark particles 12 of fairly uniform size and consisting approximately of the same constituents which compose the whole bark, although some of the phloem constituents will be found to be finely comminuted during the grinding operation. The bark is then in a suitable condition for the rapid adjustment of the moisture content of its several constituents for subsequent operations.

The first drying action occurs as the ground bark 12 is conveyed through ducts by the action of a hot air blower 13 which deposits it in a collection chamber 14. The collection chamber 14 may preferably be of the cyclone type wherein the stream of air from the blower 13 is separated from the flow of bark particles and exhausted to the atmosphere. This stream of heated air may, however, be conducted to the blower 13 for reuse in conveying and drying the bark.

From the collection chamber 14 the material is fed at a controlled feed rate onto an inclined vibrating screen 15 which may preferably be a 65 mesh screen having square openings .0082 inch on a side. The fine material which passes through the screen 15 comprises primarily bark powder, with which the present invention is not concerned. The removal of the fines in the first screening step increases the total output of the system by decreasing the load on the ball mill 16 which receives the material passing over the screen 15.

The ball mill 16 effects a controlled pulverizing action to finely comminute the friable portion of the material fed thereto, the time of treatment being in part determined by the moisture content of the material. The action of the ball mill breaks the bonds between sieve tubes and other portions of the phloem, and the cork, leaving bundles of bast fibers as a first stage in the comminution step. The time of treatment is adjusted, however, so that the bundles of bast fibers are broken up and yield individual fibers in the discharge of the ball mill along with the fine bark powder and coarser cork particles. In order to obtain the desired comminuting action in a reasonable time, the moisture content of the material leaving the collection chamber 14 must be such that any further drying action on the way to the ball mill 16 will produce the desired moisture content in the material by the time it arrives at the ball mill. Further drying takes place during milling, depending upon the time of treatment, and all these variables must be coordinated by sampling. On a typical production run the moisture content of the ground bark was found to be reduced by the drying system from 42.6% to 16.3%, oven dry basis. A moisture content of 15% to 25%, based on the dry weight of the bark, is desired.

The second screen 17 may also be a 65-mesh

4

screen, and serves to remove the balance of the fines after the ball mill, thereby reducing the amount of material to be handled in the final screening steps. The product 18 passed through the second screen comprises primarily bark powder and may be combined with the product of the screen 15 for a useful purpose. The presence of fines and cork particles on the screen 17 congests the screen openings and prevents much of the bast fiber from passing through the screen, and the control of the feed rate to effect this mode of operation is an important consideration in the practice of the invention. The screen congestion however does not block the fines from passing therethrough.

The material passing over the screen 17 comprises cork particles of various sizes, and bast fibers. This mixture is then fed to larger mesh screen 19, which may preferably be a 28-mesh screen having square openings .0232" on a side, for separating out the oversize +28-mesh material 20. The material which passes through the screen 19 contains the fiber fraction along with cork particles of a size which passes over the screen 17 and through the screen 19, this material constituting a relatively small proportion of the material handled in the initial stages of the process.

The material which passes through screen 19 is then fed onto a screen 21 which may preferably have the same size screen openings as screens 15 and 17. These units comprise woven wire screen material disposed in an inclined position and maintained in a taut condition by tension supporting means on the opposite side edges. A rigid bar is attached to the screen throughout its length along a medial line parallel to and midway between the tensioned side edges. This bar is actuated by a vibrator mechanism (not shown) to cause the screen to vibrate like a diaphragm at right angles to the plane of the screen.

The fibers constituting the ultimate fraction to be separated are rigid slender spindles having a length of roughly ten diameters, the diameter being somewhat less and the length being considerably greater than the screen openings of screens 15, 17 and 21 so that they will not pass through such a screen when they are lying flat. This accounts for the fact that all the material reaching the screen 21 has previously passed over the similar screens 15 and 17. On the screens 15 and 17 the feed rate is such that with the bulk of other material present relatively few of the fibers have the freedom necessary to up-end themselves and slip lengthwise through the openings to appear in the product 18.

A unique action takes place on the screen 21. With a slow feed rate and a relatively small amount of other material present to congest the screen openings, the ultimate individual fibers have sufficient freedom to respond to the vibration by dancing or jumping on the screen until they are perpendicular to the screening surface so that they can drop longitudinally through the openings, the fibers being too long to pass through when lying flat on the screen. The fine material having been eliminated by the screens 15 and 17, the end product 22 is a substantially pure fiber fraction.

In practice, the screens 19 and 21 may be combined to form a double deck screen unit producing oversize +28-mesh cork and fiber product 20, a coarse -28 +65-mesh cork and fiber product 23, and the -65-mesh pure fiber fraction 22. Average percentages of these three products at present

5

recovered from the screens 19 and 21 in relation to the total products produced from the bark are as follows:

	Per cent
+28 mesh material-----	4.7
+65 mesh material-----	18.3
-65 mesh fiber-----	4.6

In an operation using apparatus such as is herein described, the -65 fiber fraction 22 is found to contain about 6% cork, or, in other words, this fraction is produced at 94% purity. For use in molding compounds and the like, this fraction may be considered as pure fiber, and is herein designated as pure or substantially pure fiber.

In order to obtain this degree of fiber purity in the product 22, much fiber is lost in the other products. The product 18 ordinarily contains from 20% to 35% fiber, product 20 contains from 35% to 60% fiber, and product 23 contains from 70% to 80% fiber. The disposition or subsequent treatment of these products is immaterial to the present invention, but they are all useful and important products obtained from the operation of a bark plant using the disclosed process. The amount of fiber lost in the products 18, 20 and 23 is subject to a certain amount of control by adjustment of the different variables affecting screen congestion conditions such as feed rate, screen vibration rate, and moisture content, as indicated by the analyses of periodic samplings.

The screens are all preferably of the type of vibrating screens hereinabove described, set in inclined positions, and screens 15, 17 and 21 may be identical. The angle of inclination and the vibration rate of each screen is adjusted in coordination with the feed rate and moisture content to produce optimum screen congestion conditions on the different screens as hereinabove described.

Averages of screen analyses of the -65 mesh fiber fraction from production runs disclose variation in particle sizes according to the following percentages:

	Per cent
+65 mesh-----	7.2
-65 +100 mesh-----	50.4
-100 +200 mesh-----	40.4
-200 mesh-----	0.9

In interpreting the above percentages, it must be remembered that the screening techniques in a sample analysis are entirely different from the screening actions accomplished by the automatic vibrator screens in a production plant of the type above described. Thus, it might be expected that the 7.2% of +65 mesh material would have been removed by the screen 21 so that it could not possibly get into the product 22, and it might be expected that the 0.9% of -200 mesh material would have been eliminated in the product 18, but such is not the case. Likewise, the -100 +200 mesh sub-fraction of 40.4% might be expected to appear in the product 18 rather than in the product 22. This apparent paradox, however, is explained by the fact that the fibers are crowded into haphazard positions in a mass of other material in passing over the screen 17, and in the short time allowed by the high feed rate they are so obstructed that they cannot drop freely through the screen, even though they may become up-ended from time to time. Because the fiber spindles are long and thin, it may be difficult to screen them through a 65-mesh screen even though they are physically capable of passing through a 100-mesh screen.

6

The ultimate individual fibers of Douglas fir bark are hard and tough and seem to suffer very little from the action of the hammer mill and ball mill. The main effect of this treatment upon the fiber is the breaking up of the fiber bundles to free the individual fibers. Fibers taken from the product 22 and viewed under the microscope appear to have a spindle shape, and vary in size from .016 to .051 inch in length and from .0016 to .0055 inch in diameter at the mid section. While they show very little evidence of the rough treatment they have received, some of the fibers do appear to have become broken into short lengths and some to be partly broken or bent, as a stick of wood may be broken without separating the two ends. The short ends of broken fibers are probably lost in the material 18, the longer ends segregating themselves with the rest of the fiber fraction 22. The bent or partly broken fibers would have very great difficulty, though, in passing through the screen 21, and would account for a part of the fiber component of the product 23. The amount of fiber breakage is, of course, subject to a certain amount of control in the ball mill 16. If the fiber bundles receive insufficient treatment in the ball mill they will not be broken up to free the ultimate individual fibers and the fiber bundles themselves will consequently pass over the screens 19 and 21 and appear in the products 20 and 23. On the other hand, if the moisture content were very low, and if the feed rate were so slow that the treatment in the ball mill was unduly prolonged, undoubtedly the amount of fiber breakage would be greatly increased. As has been previously stated, the success of the present process depends largely upon the coordination of different variables to obtain a novel screening action wherein the ultimate fiber fraction will pass over a particular screen in one step and then pass through an approximately identical screen in a subsequent step to achieve the substantially complete elimination of all other fractions. The term "ultimate fiber" is used to distinguish from bark fiber bundles.

No limitation is intended by reference to a particular type of apparatus for practicing the method of the invention, the same being limited only by the scope of the appended claims. In particular, applicant does not wish to be limited to the specific apparatus referred to for performing the grinding and comminuting steps, nor does applicant wish to be limited to specific sizes of screen openings or specific fiber dimensions, except as may be specified in certain claims. References in the specification to particular apparatus and screen openings are made by way of illustration only, to describe a preferred manner of carrying out the steps of the method in a continuous process best suited for a production plant. Other apparatus for grinding and comminuting may be devised by those skilled in the art and some variance may be made in the screening apparatus by properly coordinating the variables mentioned in the specification, and all such modifications and variations are included in the invention.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. The method of producing substantially pure bark fiber comprising dry screening in a plurality of successive screening operations finely divided bark containing loose ultimate fibers having lengths substantially greater than their diameters, the screens employed in the first and

final screening operations having mesh openings of a size greater than the diameter and less than the length of the fibers, maintaining a congested layer of material on the screen during the first screening operation to restrain the fibers from passing through the screen, maintaining a relatively thin layer of material on the screen during the final screening operation and vertically vibrating the material in said final screening operation to up-end the fibers and permit them to pass through the screen while rejecting oversize material.

2. The method of producing substantially pure bark fiber from finely divided bark containing loose ultimate Douglas fir fibers having lengths substantially greater than their diameters, comprising dry screening said finely divided bark in successive screening operations, the screen employed in at least two of said screening operations having mesh openings of a size greater than the diameter and less than the length of the fibers, maintaining a congested layer of material on the screen during the first screening operation to restrain the fibers from passing through the screen while removing the fines, maintaining a relatively thin layer of material on the screen during a subsequent screening operation and vertically vibrating the material in said subsequent screening operation to up-end the fibers and permit them to pass through the screen while rejecting oversize material.

3. The method of producing substantially pure bark fiber from a mixture of whole Douglas fir bark comminuted so as to consist of cork particles, ultimate fibers having lengths substantially greater than their diameters, and a finely pulverized non-fibrous portion of the phloem, comprising successively passing said comminuted mixture in the dry over screens having mesh openings of a size slightly greater than the diameter but substantially less than length of said fibers, feeding the material to a first screen at a rate to maintain a congested layer of material thereon to restrain the fibers from passing through said screen while removing the fines, feeding the overs to a subsequent screen at a rate to maintain a relatively thin layer of material thereon to enable freedom of movement of the loose fibers, and vertically vibrating the material on said subsequent screen to cause said fibers to up-end and pass through said screen while the oversize fraction of cork particles is being rejected.

4. In the method of producing substantially pure Douglas fir bark fiber from a finely comminuted bark mixture containing loose ultimate Douglas fir fibers having lengths of from .016 to .051 inch and diameters of from .0016 to .0055 inch, the steps of successively dry screening said mixture over two screens having approximately .0082 inch mesh openings, the first screening step being conducted while maintaining a congested layer of material thereon to restrain the fibers from passing therethrough while removing the fines, the second screening step being conducted while maintaining a relatively thin layer of material thereon to permit the fibers freedom of movement, and actuating said second screen to cause said fibers to up-end and pass therethrough while rejecting oversize material as overs.

5. The method of producing substantially pure bark fiber from finely divided bark containing loose ultimate fibers having lengths substantially greater than their diameters comprising dry screening said finely divided bark in three successive screening operations, each of the screens

employed in the first and third operation having mesh openings of a size greater than the diameter and less than the length of the fibers and the screen employed in the second operation having mesh openings of coarser size, maintaining a congested layer of material on the screen during the first screening operation to restrain the fibers from passing through said first screen, passing the overs from the first screen to the second screen to reject during the second operation a coarse fraction of material while passing therethrough a substantial portion of the fibers, maintaining the throughs from said second screening operation in a relatively thin layer on the screen during the third screening operation and vertically vibrating the material in said third screening operation to up-end the fibers and permit them to pass through said third screen while rejecting oversize material.

6. The method of producing substantially pure bark fiber from finely divided whole Douglas fir bark containing loose ultimate fibers having lengths substantially greater than their diameters, comprising dry screening said finely divided bark in a plurality of successive screening steps, the screen employed in the first and final steps having mesh openings of a size greater than the diameter and less than the length of the fibers and the screen employed in an intermediate step having a mesh opening of coarser size, maintaining a congested layer of material during said first screening step to restrain the fibers from passing through the screen, passing the overs from said first screening step to the screen employed in said intermediate step to remove a coarse fraction of material while passing therethrough a substantial portion of the fibers, maintaining the throughs from said intermediate screening step in a relatively thin layer on the screen in said final screening step and vertically vibrating the material in said final screening operation to up-end the fibers and permit them to pass through the screen while rejecting oversize material.

7. The method of producing substantially pure bark fiber from a mixture of finely divided Douglas fir bark containing cork particles, loose ultimate fibers having lengths of from .016 to .051 inch and diameters of from .0016 to .0055 inch, and a finely pulverized portion of the phloem, comprising successively passing said finely divided mixture in the dry over a plurality of screens, the first and final screens being 65 mesh and an intermediate screen being 28 mesh, maintaining a congested layer of material on the first screen to restrain the fibers from passing through said screen while removing the fines, passing the overs from said first screen to said intermediate screen to reject a coarse fraction of cork particles, maintaining the throughs from said second screen in a relatively thin layer on the final screen and vertically vibrating the material on said final screen to up-end the fibers and permit them to pass through said screen while rejecting oversize material.

ROBERT D. PAULEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
77,829	Miller	May 12, 1868
378,516	Oliver	Feb. 28, 1888

(Other references on following page)

2,446,551

10

UNITED STATES PATENTS

Number	Name	Date
1,226,263	Rustin -----	May 15, 1917
1,455,762	Howard -----	May 15, 1923
1,870,166	Bond -----	Aug. 2, 1932
2,058,959	Denning -----	Oct. 27, 1936
2,225,909	Gruender -----	Dec. 24, 1940
2,238,454	Steele -----	Apr. 15, 1941
2,286,643	Phillips -----	June 16, 1942
2,311,813	Beck -----	Feb. 23, 1943
2,320,755	Smith -----	June 1, 1943
2,361,946	Johnson -----	Nov. 7, 1944

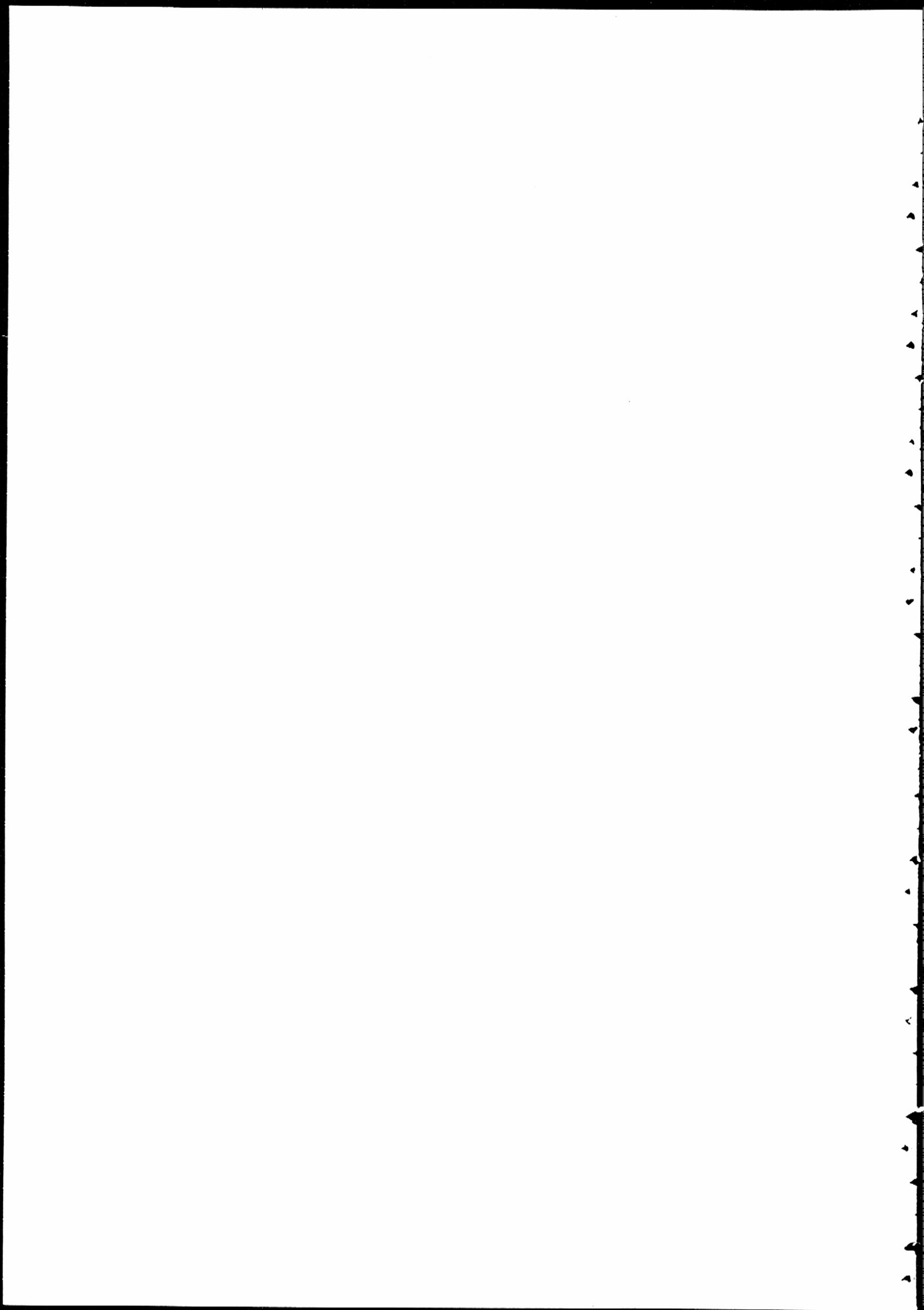
FOREIGN PATENTS

Number	Country	Date
25,198	Netherlands -----	Sept. 16, 1931
280,721	Great Britain -----	Nov. 24, 1927

OTHER REFERENCES

Industrial & Engineering Chemistry, Aug. 1944,
pp. 759-764.

Wise—Wood Chemistry, Reinhold Pub. Co.,
N. Y., 1944, pp. 9-10.



*Defendant's Exhibit 1—Examiner's Answer.***Examiner's Answer**

This is an appeal from the final rejection of claims 1 through 4, 11 through 13, and 28 through 39. Claims 28 through 39 are copied from reissue patent, 24,174, to Heritage for the purpose of instituting an interference.

* * * * *

Claims 28-39, which were copied from the Heritage patent, stand rejected as lacking adequate basis in applicants' disclosure. Each of these claims requires the use as binder of a "separated" or "isolated" cork fraction of bark, which may be Douglas Fir bark. The article is a hard board. The other components are wood particles and particles of comminuted whole bark. Claims 8-32 and 39 are drawn to the article. Claims 33-38 are method claims. All of the claims require that the proportion of separated or isolated cork in the composition be not less than 5%. Every claim of Heritage is thus limited and no claim is broad enough to read on the mere use in making a hardboard of comminuted bark or comminuted Douglas Fir bark as the binder. The advantages of the use of isolated cork particles are brought out in a paragraph quoted from the argument of Heritage on page 2 of the Office action of July 24, 1956, Paper No. 18.

"In using whole bark, the cork component is present but it does not enter the mixture as isolated cork particles. It was indicated when the cork particles are isolated from the remainder of the constituents of the bark, each cork particle has its entire surface free and exposed, without attachment to other bark ingredients whereby its entire surface is available to function as binder for the fibers."

Nowhere in this application is any mention made of the cork component of bark or of isolating the same.

Applicants and Heritage comminute or defibrate their bark in the same manner, employing a known defibrating machine such as the Asplund or Bauer machine. Applicants contend and have presented two affidavits by Dr. John G. Meiler in an attempt to prove that the mere comminution or defibration of the bark automatically separates or isolates the cork particles. (Papers No. 14, 23 and 24). These affidavits set forth that when Douglas fir bark is comminuted or defibrated by a Bauer mill, it is reduced to a mixture of three components, viz. (1) bast fibers, (2) powdered parenchyma, and (3) cork. They further disclose separation of the cork from the mixture by permitting it to float upon the surface of water contained in or added to the mixture. Along with Paper No. 24 are presented exhibits propoing to be the cork and other fractions produced. As brought out in Paper No. 14, in carrying out the process of the present application the floating cork fraction is recombined with the other components in its entirety, the mixture serving as the binder component or bark component of the product.

Heritage, like the Van Beckum et al patent and the Meiler affidavit, indicates that when the bark of coniferous trees is comminuted it breaks down into three components, cork sclerenchyma tissue and parenchyma tissue. He states that the cork and parenchyma tissue fractions are both thermoplastic. He states that, however, that the cork component as the binding material is preferred in the molding of a board since it has better flow characteristics than the parenchyma tissue component and results in the production of boards having higher strength-density ratios than can be obtained with

Defendant's Exhibit 1—Examiner's Answer.

the use of parenchyma tissue. (column 1, line 58 through column 2, line 2) Heritage goes on to state in the next paragraph that the bark may be fractionated into its separate components by methods which rely on the selective comminution of the bark constituents followed by the application of mechanical means for separating the products of various particles size. As representative of such methods, he discloses the screening methods of the Anway and Pauley patents. The latter portion of this paragraph which describes the comminuting operations cannot be properly interpreted to mean that the three fractions are obtained and separated by comminution alone without the screening mentioned above. Such separation of the cork component as is described in the Meiler affidavits amounts to the substitution of a sink and float separation procedure, which is also a mechanical method of separation, for the screening method disclosed by Heritage. Such sink and float separation, although it may be to some degree inherent in the disclosed comminuting process, is not *per se* a part of applicants' original disclosure and in the disclosure no use is made of it to isolate the cork or control the proportion of it in the molding mixture. The fact that applicants' comminuted whole bark has binding properties does not indicate that the binding is done by the cork to the same extent and in the same manner as in Heritage since the binding may be largely due to the parenchyma tissue which Heritage rejects and which Van Beckum makes use of as a glue.

The word "isolated" in the Heritage claims must be taken as describing the state of the cork particles after they had been separated from the comminuted bark by screening. The file history of Heritage shows that this

Defendant's Exhibit 1—Decision of Board.

word was adopted after the use of the word "separated" had been objected to in the product claims as constituting a process limitation.

The product of Heritage is, moreover, considered to necessarily contain a higher proportion of cork than that of applicant, since it contains either cork to the exclusion of whole bark or whole bark plus an added proportion of cork.

Decision of Board of Appeals

This is an appeal from the final rejection of claims 1, 2, 3, 4, 11, 12, 13 and 28 through 39.

* * * * *

Claims 28 through 39 are rejected by the examiner as lacking adequate basis in the disclosure presented by appellants. These claims refer to the binder as a "separated" or "isolated" cork faction of bark and it is the examiner's position that the disclosure of a comminuted bark used in a mixture, or alone, does not provide a product or method forming a proper basis for the appealed claims.

Appellants argue that the use of comminuted Douglas fir bark inherently results in a fractionation of the bark products and would thus present in the mixture a cork component of the bark in disassociated form to serve as a binder in consolidating the fiberboard. It is established by affidavits and exhibits that Douglas fir bark in comminuted form in a slurry will present cork particles at the surface by flotation while other components of the bark settle from the slurry.

Claims 28 through 39 were copied from the Heritage patent for purposes of interference. This patent, by its

Defendant's Exhibit 1—Decision of Board.

disclosure and by reference to patents including Anway and Pauley, presents a specific embodiment of fiberboard binding in which the cork fraction of whole bark from trees such as Douglas fir is separated, reduced to a powder, and added to wood fibers to produce a product found to have desirable properties. The Heritage disclosure specifies use of only the cork component of bark for his binder in the more precise examples recited. The Heritage disclosure proposes the reduction of the separated cork component to a fine powder and the mixing of this fine cork powder with wood fibers. Particularly at column 2, lines 57 to 66 the use of whole bark is also mentioned. In the prosecution of the Heritage application distinction was drawn between the incidental inclusion of cork as a bark component and the addition of separated cork. The amendment in the Heritage file, which appears to have been instrumental in securing the allowance of his claims, introduced such wording as underlined in the following quotation from the first four lines of appealed claim 28:

“ . . . comprising a closely compacted *heat bonded mixture originally* of wood particles and *particles of isolated cork originating in* the bark of coniferous trees”.

The argument by Heritage accompanying such amendment is quoted by the examiner at the top of page 6 of his statement and clearly indicates the intention of limiting the origin of the cork particles to a condition as described in the dominant examples of his specification where a purified cork component was specially prepared for intimate admixture with wood fiber without the intervention of deleterious refuse from the other bark fractions. Whether appellants have discovered these other bark fractions to be more than an inert filler in

connection with the binding function of the cork is not important to the issue before us. Heritage specially prepared the cork component of bark from coniferous trees and presents this as his claimed contribution. Appellants, on the other hand, use the whole bark of Douglas fir and mix its resulting constituents in connection with comminuting and follow with a wet or dry felting process. We are not convinced that appellants inherently disclose a separation of the bark into a cork component by reason of their processing. The fact that bark particles may separate from a slurry does not establish such a step in appellants' processing or that the bark so separated is of a fineness to present pure cork particles as distinguished from particles having attachment to other bark ingredients as described in the Heritage argument.

Where ambiguity exists in the interpretation of claims copied from a patent it is clearly established that the meaning is to be determined from the application in which the claims arose. *In re Knowles et al.*, 33 C.C.P.A. 819; 1946 C.D. 157; 587 O.G. 181; 153 F. (2d) 462; 69 USPQ 66. Applying the Heritage prosecution record to the terms of claims 28, 29, 30, 31, 32 and 39 it is clear to us that the article recited is limited to cork binder that had its origin as a separated or isolated ingredient prior to admixture to wood particles. Method claims 33 through 38 are even more clearly limited to a sequence in which a separated cork fraction of bark origin is introduced into the mixture. For reasons as recited in the preceding paragraph we consider appellants' disclosure not to support such claims and affirm the rejection of claims 28 through 39 as lacking adequate basis in appellants' disclosure.

The decision of the examiner is affirmed.

Defendant's Exhibit 3—Amendment.

**Excerpts From Defendant's Exhibit 3, File Wrapper Of
Heritage Patent Re. 24,174**

AMENDMENT NO. 1

After Final Rejection of January 31, 1955

Hon. Commissioner of Patents
Washington, D. C.

Sir:

Applicant proposes to amend as follows:

Claim 29, line 2, change "mixture" to --- heat-bonded mixture originally ---.

Claim 29, line 3, cancel "bound together by a comminuted fraction of" to --- and particles of isolated cork originating in ---.

Claim 29, line 3 at the end, cancel "a".

Claim 29, line 4, change "tree" to ---trees ---.

Claim 29, lines 4 and 5, cancel "fraction having been separated from the bark matrix and" to --- cork ---.

Claim 29, line 6, place a period (.) after "mixture" and cancel the remainder.

Claim 30, line 2, change "mixture" to --- heat-bonded mixture originally ---.

Claim 30, line 2 at the end, place a comma (,).

Claim 30, line 3, change "and" to -- particles of ---.

Claim 30, line 3, beginning with "a coniferous" cancel through "is" in line 6 and substitute --- coniferous trees, and particles of isolated cork originating in such bark, said cork being ---.

Defendant's Exhibit 3—Amendment.

Claim 30, last line, after "mixture" place a period (.) and cancel the remainder.

Claim 31, line 2, change "mixture" to --- heat-bonded mixture originally ---.

Claim 31, cancel lines 3 through 7 and substitute --- and particles originating in the bark of coniferous trees, the mixture comprising by dry weight from 25% to 95% of said wood particles, and the remainder being said particles from the bark and including particles of isolated cork in amount of at least ---.

Claim 32, lines 2 and 3, change "such as that produced by the Asplund Defibrator" to --- containing substantially all the substance of the raw wood from which the fiber is derived ---.

Claim 32, lines 3 and 4, change "bark and cork component are comminuted" to --- particles of bark having a size distribution ---.

Claim 33, change the last four lines to read --- is present in amount by weight in the range from 60 to 95 parts and the particles from the bark are correspondingly present in amount in the range from 40 to 5 parts. ---.

Claim 34, line 4, change "a coniferous tree" to --- coniferous trees ---.

Claim 35, line 3, change "the" to --- comminuted ---.

Claim 35, line 6, after "time" insert --- being ---.

Claim 38, line 3, change "the comminuted" to --- comminuted material originating in the ---.

Claim 38, line 3, place a comma (,) after "trees" and cancel "and a separated component of said bark";

Defendant's Exhibit 3—Amendment.

and substitute --- said material including particles of isolated cork in amount of at least 5% by weight of the mixture; ---.

Claim 38, line 10, change "the bark component" to --- bark material ---.

Claim 39, line 3, change "whole" to --- comminuted ---.

Claim 39, lines 3 and 4, cancel "the separated cork component of said bark," and substitute --- at least 5% by weight of the mixture of particles of isolated cork originating in such bark, ---.

Claim 39, line 2 from the end, change "the cork component of the bark" to --- bark material ---.

Claim 40, lines 4 and 5, change "the separated cork component of" to --- particles of isolated cork originating in ---.

Claim 40, line 6, cancel "of wood particles and bark".

Claim 40, line 2 from the end, change "the bark particles" to --- bark material ---.

Claim 41, line 3, change "the" to --- comminuted ---.

Claim 41, line 4, change "of" to --- originating in ---.

Claim 41, line 6, change "and" to --- material of which at least 5 parts is said ---.

Claim 42, line 3, before "whole" insert --- comminuted ---.

Claim 42, lines 3 and 4, cancel "a separated cork component of said" and substitute --- particles of isolated cork originating in such ---.

Defendant's Exhibit 3—Amendment.

Claim 42, line 5, change "and cork component," to --- material comprising at least 5 parts of said isolated cork, ---.

Claim 42, lines 6 and 7, cancel "and cork particles," and substitute --- material to form a mat, ---.

Claim 43, line 3, change "the" to --- comminuted ---.

Claim 43, line 4, change "a separated cork component of said bark" to --- particles of isolated cork originating in such bark, said cork particles being present in amount which is at least 5% by weight of the mixture, ---.

Claim 43, line 7, change "cork component" to --- bark material ---.

Claim 45, line 4, change "the" to --- comminuted ---.

Claim 46, beginning with "the bark" in line 4 cancel through the comma (,) in line 6 and substitute --- comminuted material originating in the bark of coniferous trees of which material at least 5 parts consists of particles of isolated cork, ---.

Claim 47, change line 2 to read --- of lumber comprising a heat-bonded mixture originally of wood particles, ---.

Claim 47, line 4, change "of said" to --- originating in such ---.

Claim 47, line 4 at the end, add --- by weight ---.

Defendant's Exhibit 3—Amendment.

REMARKS

Reference is made to an interview on March 18th with the Assistant Examiner in charge of this application and the Examiner in Division 63 to which the product claims have been referred. The representative of the associate attorney of record, who held the interview, has prepared this Amendment based upon the proposals submitted at the interviews.

It is pointed out particularly that the present Amendment makes slight changes in allowed claims 34, 35, 45 and 46 for the purpose of improving the context of the claims in relating them to remaining claims as this Amendment is proposed.

In claim 34, reference to "a coniferous tree" has been changed to --- coniferous trees ---.

In claim 35, the word "comminuted" has been used to limit the character of the bark in the mixture.

In claim 45, the word "comminuted" has been used to limit the character of the bark.

In claim 46, the description of the bark and percentage has been modified for one reason to change the expression "5%" to --- 5 parts --- in keeping with the remainder of the composition specified as parts.

The amendments to the method claims are based largely upon specifying that there is at least 5% of the isolated cork material in the composition. Other formal changes are self-explanatory. It is pointed out that the originally-described cork component is now specified as isolated cork particles, overcomes the application of the prior art in the rejection. In using a whole bark, the

Defendant's Exhibit 3—Amendment.

cork component is present but it does not enter the mixture as isolated cork particles. It was indicated when the cork particles are isolated from the remainder of the constituents of the bark, each cork particle has its entire surface free and exposed, without attachment to other bark ingredients, whereby its entire surface is available to function as binder for the fibers.

The product claims have been amended to overcome the processing limitation. This has been done by the expedient of reciting that the product is a "heat-bonded mixture originally of wood particles ---".

Claim 32 has been amended to meet the Examiner's objection. The Examiner did not object to the expression "Asplund Defibrator", but the claim has been amended to eliminate that and express the intended meaning. Reference is made to page 4, lines 5 through 8, wherein the Asplund patents are referred to, and wherein also the McMillan patent is referred to. In the Asplund patents, all the substance of the wood is retained, with some slight modification in composition by the momentary action of steam in the process. In the McMillan patent, the fibers are mechanically combed from wood. Claim 32, as amended, is generic to fibers from both Asplund and McMillan processes.

It is respectfully requested that the foregoing Amendment be entered and the application allowed. Otherwise, an advisory action is respectfully requested.

Signed this 7th day of April, 1955, at Tacoma, Washington.

CLARK C. HERITAGE

By LESLIE G. NOLLER

Associate Attorney of Record

*Opinion.***Opinion**

This is a civil action under 35 U.S.C.A. §145 in which plaintiffs seek to compel the Patent Office to declare an interference between plaintiffs' application, Serial No. 406,319, entitled "Composition Boards Containing Douglas Fir Bark" and the patent issued to Clark C. Heritage (Re. 24,174), entitled "Cork-Bound Hot-Pressed Boards". The general subject matter involved here is the manufacture of composition boards from the components found in the wood and bark of coniferous trees such as the Douglas Fir. The specific controversy centers on the method of utilizing the "cork" component of the bark as a binder for the wood and bark fibers by the application of moderately high temperatures which cause the cork to flow throughout the whole mixture of fibers. The mixture would then be subjected to pressure sufficient to produce a board-like substance of greater or lesser density, with substantial strength and water-resistant properties. The value of using the cork element from the bark is that it reduces the need for adding quantities of more expensive "sizing" materials.

The following two claims out of the twelve in issue here serve to illustrate the Heritage process with the disputed words underscored:

"2. (29) A hard rigid board of the character of lumber comprising a closely compacted heat-bonded mixture originally of wood particles, particles of the bark of coniferous trees, and particles of *isolated cork originating in such bark*, said cork being present in an amount equal to at least 5% of the mixture and said particles being present in amount in the range from 25% to 95% of the mixture.

Opinion.

"7. (34) A method of making a hot pressed hard rigid board of the character of lumber comprising the steps of admixing wood particles, comminuted bark of coniferous trees and a *separated cork fraction of said bark*, the latter being in an amount of at least 5% of the mixture and pressing the mixture under conditions of heat, pressure and time being sufficient to increase the density of the mixed mass into a hard compact board, and to cause the cork component to flow into intimate bonding admixture with the wood particles and bark."

A representative summary of plaintiffs' disclosure may be found on page 4 of their specification (Plaintiffs' ex. 1, p. 4) :

"It is the essence of the present invention that, surprisingly and contrary to the teaching of the prior art, the bark of the Douglas fir when incorporated in fibrous composition boards not only is not detrimental, but actually enhances the value of the boards by increasing their water resistance to acceptable limits without seriously reducing their strength or otherwise adversely affecting their properties."

Plaintiffs contend that the use of comminuted Douglas fir bark results in the disassociation of the cork from the other bark components during the normal course of processing, thus freeing them for the most effective action as a binder. In the view of the Patent Office, however, the Heritage patent was primarily concerned with the complete isolation of the cork from the bark, the treatment of the cork and the mixing of this relatively pure cork with various proportions of wood fibers. As

Opinion.

the Board of Appeals stated at pages 59-60 of defendant's exhibit 1:

"... Heritage specially prepared the cork component bark from coniferous trees and presents this as his claimed contribution. Appellants, on the other hand, use the whole bark of Douglas fir and mix its resulting constituents in connection with comminuting and follow with a wet or dry felting process. *We are not convinced the appellants inherently disclose a separation of the bark into a cork component by reason of their processing.* The fact that bark particles may separate from a slurry does not establish such a step in appellants' processing or that the bark so separated is of a fineness to present pure cork particles as distinguished from particles having attachment to other bark ingredients as described in the Heritage argument." (Emphasis supplied).

On the basis of this reasoning, the examiner and the Board of Appeals agreed that plaintiffs' claims for an interference or conflict with the Heritage patent should be denied. This requirement of "inherent disclosure" is explained in the case of *Hoover Co. v. Ooms*, 80 U.S. App. D.C. 318, 153 F2d 123, 125 (1946), where it is stated:

"It is thoroughly established that one who copies claims for interference cannot prevail unless his application discloses, expressly or inherently, the elements and limitations prescribed by the claim. It is insufficient that a certain result may come from a given set of circumstances."

In applying these principles, the Patent Office, with its extensive experience, came to the conclusion that plain-

tiffs' application does not disclose substantially the same patentable invention as that described in the Heritage patent.

In making its ruling, the Court is only concerned with whether the finding of the Patent Office that plaintiffs did not disclose substantially the same patentable invention as Heritage is consistent with the evidence. Cf. *Abbott v. Coe*, 71 App. D.C. 195, 109 F.2d 449, 451 (1939). Furthermore, as was pointed out in *Hoover Co. v. Ooms*, supra:

"... when one copies the claim of another's patent for interference purposes the claims of the patent from which he copied determine the issue."

After examining both the Heritage patent and plaintiffs' application it would seem that the wording of the Heritage claims tends to support the Patent Office ruling. In claim 2 (copied as claim 29) above, three components of the board are listed as: 1. wood particles, 2. particles of the bark of coniferous trees, and 3. particles of *isolated* cork *originating* in such bark. These items are distinctly listed in the claim. No greater physical connection is implied between 2 and 3 than between 1 and 2. In addition, the use of the term "isolated" and "originating" together implies a complete removal of the cork from the location where it originally was; i.e., within the whole bark. Again with respect to claim 7 (copied as claim 34) above, the words used are "a *separated* cork *fraction* of said bark". The term "fraction" itself generally denotes a portion of a substance collected apart from the other components of the substance (Cf. Webster's New International Dictionary, 2d Ed., 1957 at p. 1000) and this idea has been emphasized by the use

Opinion.

of the word "separated" along with it. Thus, the Patent Office ruling finds support in the claims themselves.

Assuming *arguendo* that the Heritage claims can be considered ambiguous, the court finds sufficient indications in the specification of Heritage that the primary concept is the use of separately collected cork particles obtained by a distinct step in the processing. This is revealed particularly in the paragraph at column 2, lines 3 to 35, quoted in part as follows:

"The bark may be fractionated into its separate components by methods which rely upon the selective comminution of the bark constituents followed by the application of mechanical methods for separating the products of various particle size. Such methods are represented by those disclosed in the patent to Anway for Method of Treating Bark . . . in the patent to Pauley for Production of Pure Bark Fiber . . . and in the copending application of Bror L. Grondal and Calvin L. Dickinson, for Method of Treating Bark. . . . The whole bark is subjected to one or more comminuting operations at a controlled moisture content, whereby the non-fibrous phloem is reduced to a powder, the fiber bundles are opened up to release the individual fibers, but the relatively resistant aggregates of cork cells comprising the cork layers are not substantially reduced in size. There are thus produced three fractions having different particle sizes, i.e., powdered phloem or parenchyma tissue, ultimate fibers or stone cells (sclerenchyma tissue), and natural cork."

The Anway and Pauley patents relate to mechanical methods for entirely isolating cork and other particles by the use of screens of various sizes. The preferability

Opinion.

of using pure cork over the use of whole bark is also emphasized in Heritage at column 2, lines 26 to 56. Moreover, Heritage cites tests that show that the presence of 20% of bark impurities in the cork reduces the rupture strength of the finished board three times in comparison with board involving the use of pure cork (column 10, lines 7 to 11). These passages and others stressed by defendant furnish an adequate basis, for holding that plaintiffs' application does not disclose substantially the same patentable invention as that of Heritage. Based upon all the testimony and exhibits adduced at trial, the Court is convinced that a rational basis existed for the ruling of the Patent Office in denying an interference with the Heritage patent. Judgment, therefore, will be entered for defendant.

Counsel for defendant will prepare proposed findings of fact, conclusions of law, and an appropriate order within one week from this date.

/s/ JOHN J. SIRICA

United States District Judge

*Findings of Fact.***Findings of Fact**

1. This is an action under Title 35 of the United States Code, Section 145, in which the plaintiffs, Lyllian F. Lighthall, Administratrix of the estate of Albert C. Lighthall, deceased, Arthur B. Anderson, Albert C. Lighthall, Jr., Trustee, and Blaw-Knox Company sought to have the Court authorize the allowance of claims 28 through 39 of the application for patent by Lyllian F. Lighthall, as administratrix of the estate of Albert C. Lighthall, and Arthur B. Anderson, Serial No. 406,319, filed in the Patent Office on January 26, 1954, entitled "Composition Boards Containing Douglas Fir Bark", designated hereinafter as the "Lighthall-Anderson" application.

2. The Lighthall-Anderson application relates to water resistant strong composition boards and like products containing lignocellulose in particle form together with comminuted or defiberized Douglas Fir bark as an assertedly unique additive component. The application states:

"* * * surprisingly and contrary to the teaching of the prior art, the bark of the Douglas fir when incorporated in fibrous composition boards not only is not detrimental, but actually enhances the value of the boards by increasing their water resistance to acceptable limits without seriously reducing their strength or otherwise adversely affecting their properties."

3. The patent to Clark C. Heritage, Reissue No. 24,174, relates to the utilization of the cork component of the bark of coniferous trees as a thermoplastic binding material for binding together fibers or other wood

particles conventionally used in the making of hot pressed structures, such as boards and molded articles. Heritage states that cork for such use may be obtained by fractionating coniferous tree bark into its separate components by methods which rely upon the selective comminution of the bark constituents followed by the application of mechanical methods for separating the products of various particle size as disclosed, for example, in the patent to Anway No. 2,437,672 and Pauley No. 2,446,551. These patents relate to mechanical methods for entirely isolating cork and other particles by the use of screens of various sizes. Heritage states in his specification that the use of whole bark containing an appreciable amount of cork is "of practical utility" in practicing his invention (column 2, lines 57 to 61), but he emphasizes the preferability of using pure cork over the use of whole bark (column 2, lines 26 to 56). Further he cites tests which show that the presence of 20% of bark impurities in cork reduces the rupture strength of the finished board three times in comparison with board involving the use of pure cork (column 10, lines 7 to 11).

4. The claims in suit were copied from the Heritage patent. Claims 29 and 34 (claims 2 and 7, respectively, of Heritage) are exemplary. In claim 29 three components of the mixture from which the product is formed are distinctly listed as: 1. wood particles, 2. particles of the bark of coniferous trees, and, 3. particles of *isolated* cork *originating* in such bark. In claim 34, the words used are "a *separated* cork *fraction* of said bark."

5. The Court is of the opinion that the use in claims such as claim 29, of the terms "isolated" and "originating" together implies a complete removal of the cork

Findings of Fact.

from the location where it originally was; i.e., within the whole bark.

6. The Court is of the opinion that the term "fraction" itself generally denotes a portion of a substance collected apart from the other components of the substance and that this idea has been emphasized by the use, in claims such as claim 34, of the word "separated" along with it.

7. The Court is of the opinion that the Patent Office ruling that the claims in suit call for the use of pure cork which has been segregated from other bark constituents, finds support in the claims themselves.

8. The Court believes there is sufficient indication in the Heritage patent specification that his primary concept is the use of separately collected cork particles obtained by a distinct step in the processing.

9. The Lighthall-Anderson application in suit does not disclose the subject matter of the Heritage patent claims copied therein as claims 28 through 39.

*Conclusions of Law.***Conclusions of Law**

1. Where the Patent Office has found that an application for patent does not disclose the subject matter of claims presented in that application, the Court, in an action under 35 U.S.C., section 145, is only concerned with whether the Patent Office finding is consistent with the evidence.

2. Claims 28 through 39 of the Lighthall-Anderson application Serial No. 406,319 are not allowable therein as a basis for an interference with the Heritage patent Reissue No. 24,174.

3. Lyllian F. Lighthall, administratrix, and Arthur B. Anderson are not entitled to a patent containing any one of the claims 28 through 39 of their application for patent Serial No. 406,319.

4. The complaint should be dismissed.

/s/ JOHN J. SIRICA
Judge

July 1, 1959.

Seen:

/s/ SPENCER B. MICHAEL

*Notice of Appeal.***Judgment**

This action came on to be heard at the last term, and thereupon upon consideration thereof, it is this 8th day of July, 1959

ADJUDGED that the complaint be and it is hereby dismissed, with costs against plaintiff.

/s/ JOHN J. SIRICA
Judge

Approved as to Form:

/s/ SPENCER B. MICHAEL
Attorney for Plaintiff

Notice of Appeal

Notice is hereby given 2nd day of September, 1959, that plaintiffs hereby appeal to the United States Court of Appeals for the District of Columbia from the Judgment of this Court entered on the 8th day of July, 1959, in favor of the defendant and against said plaintiffs.
